




LIBRARY
ROYAL ONTARIO MUSEUM



Digitized by the Internet Archive
in 2012 with funding from
Royal Ontario Museum

<http://archive.org/details/bulletin00roya>

ROYAL ONTARIO MUSEUM OF ZOOLOGY

BULLETIN No. 1

UNIVERSITY OF TORONTO, JUNE, 1928



WHALE-HEADED STORK; SHOE-BILL; BOAT-BILL

Balaeniceps rex Gould

This fine specimen of the rare Shoe-bill was presented to the Museum by H. S. Osler, Esq. who shot it near the junction of the Bahr-el-Ghazal and Lake No. in the Anglo-Egyptian Sudan on March 25, 1924. It has a wing spread of nine feet. The Arab name of the bird, Abu Markub (Father of a Shoe) fully expresses the extraordinary character of the beak.



ROYAL ONTARIO MUSEUM

FOREWORD

FOR some time the Museum has felt the need of some medium by means of which those interested in its work and expansion could be kept in more intimate touch with its activities. It is perhaps not sufficiently realized to what an extent the development of a Museum of Zoology depends on the active interest of those persons in the community for whom natural history has a special appeal.

A Museum is a public institution. Its collections of beautiful and interesting objects, the creations of man and of nature are maintained for the enjoyment and education of the public. It is therefore the duty of the interested public to give some thought to the enlargement and improvement of its collection.

It is the aim of the series of bulletins, of which this is the first, to keep those interested in the Royal Ontario Museum of Zoology informed as to happenings and accomplishments in its field of work. For the present at least the BULLETIN will appear only at irregular intervals, although it is hoped that with the increase of the Museum's staff and financial resources it may develop into a regular periodical.

The Wallace Havelock Robb Collection. Announcement was made some time ago of the presentation to the Museum of a collection of paintings of birds of Eastern Canada. This collection consists of 51 paintings by Major Allan Brooks, D.S.O., of Okanagan Landing, B.C., one of the greatest of living bird artists, and owes its existence to Mr. Wallace Havelock Robb of Belleville. In his efforts to bring together a collection of bird paintings by Allan Brooks, Mr. Robb has had the support of a number of persons both in the United States and Canada, but it is to him that the chief credit for the building of the collection belongs. Mr. Robb has given it to this Museum to hold in trust for the people of Canada, to aid in stimulating an appreciation of the beauty and value of our native birds. The paintings are now on exhibition in the Museum gallery.

Reproductions of Bird Paintings. Through the courtesy of the Howard Smith Paper Mills Ltd. of Montreal who have reproduced 12 of the Allan Brooks bird paintings from the Wallace Havelock Robb collection for their 1928-29 calendar, the Museum has been able to obtain a number of sets of these reproductions for sale at a nominal price. These reproductions, which are 9 by 11 inches, have been very faithfully reproduced in full colour. The birds represented in this collection are,—Baltimore oriole, ruby-throated hummingbird, goldfinch, blue jay, loon, ruffed grouse, screech owl, flicker, chickadee and white-breasted nuthatch, belted kingfisher, scarlet tanager, bluebird.

The twelve reproductions will be mailed to any address for fifty cents. Please remit by Postal Note or Money Order.

Game Fish Collection. The Museum now has a fine series of coloured casts of Canadian game fishes including the following species,—Atlantic salmon, sebago salmon, ouananiche, steelhead, rainbow trout, Kamloops trout, cut-throat trout, eastern speckled trout, (of several colour variations), Marston's trout, Dolly Varden, lake trout, king salmon, grayling, pike, maskinonge, small and large-mouthed black bass and yellow pickerel. Two of the rarest of Canada's game species, *viz.*, the ouananiche and Marston's trout were added to the collection last summer through the co-operation of the Canadian Pacific Railway Company who are publishing soon a booklet on the Game Fish of Canada illustrated with 16 coloured illustrations reproduced from the Museum's coloured casts.

The Museum has also published a 20-page Guide to the Game Fishes of Canada which sells for 10 cents. This guide is not illustrated but contains descriptions of the species included in the Museum's collection.

A party from the Museum, consisting of Prof. J. R. Dymond, T. B. Kurata, and E. B. S. Logier, will study the trout of British Columbia during the coming summer. Under the auspices of the Biological Board of Canada, Professor Dymond will continue the studies he began two years ago, which have as their object the settling of the question as to the relationship of the various species found in the waters of British Columbia. Mr. Logier will make colour sketches of various species while Mr.

Kurata will cast varieties and colour phases not already represented in the Museum collection. General collecting will also be done.

The Museum's Faunal Survey of Ontario. Five years ago the Museum undertook a faunal survey of Ontario. Lake Nipigon, Lake Abitibi, the Toronto region and Long Point, Lake Erie, have been visited in connection with this work which aims at giving detailed and accurate information as to the natural history of the areas concerned.

During the present summer L. L. Snyder, associate in ornithology, H. P. Stovell and Mr. John Edmonds will visit Long Point during the month of May to continue the investigation of this area which was initiated last season. During the course of the study of the resident fauna carried on last June and July it was realized that Long Point was so important as a field for migration studies, particularly in the case of wild fowl and shore birds, that it was deemed advisable to send a special expedition to make these studies this spring. The Long Point Company which owns and acts as guardian of the Point is materially assisting in the survey by giving free use of boats, cabins, and other field necessities.

J. L. Baillie will do ornithological collecting at Ashbridge's bay, Toronto, during the month of May. This area was formerly a noted resort of migratory birds but it is rapidly being defaced by harbour developments. Within the coming year it is expected that commercial improvements will finally erase all conditions which made it attractive to bird life. Mr. Baillie will include an historical account of the area with his report on the birds found there this spring.

THE LIFE HISTORY AND CONSERVATION OF THE BLACK BASS.

THERE is at present a great deal of concern over the serious depletion of game fish in many parts of Ontario. On account of the increase of tourists visiting the Province in summer and the easier access which good roads and the motor car give to fishing districts, the bass, trout, and maskinonge especially, are becom-

ing very scarce in many areas where formerly they were found in abundance.

Among game species no fish surpasses the small-mouthed black bass (*Micropterus dolomieu* Lacépède) in popularity and it is worth giving serious thought to its conservation. One of the first essentials towards accomplishing this is the understanding of the fish's life history. That history is not yet sufficiently known but the following is a brief outline of some of the habits of this interesting species.

In late May or June, and in some places much later, depending on whether the season is early or late, the male bass begins to make his nest. He likes best a shallow place where the bottom is covered with coarse gravel and where there is a log, a big rock, or a bank to afford protection so that he will have to look out for enemies on only one side. Carefully he sweeps away the mud and rubbish from an area two or three feet across. The female does not deposit the eggs on any particular day according to the calendar but waits until the water gets fairly warm (62° to 65° Fahrenheit). In some years and in some districts the water does not reach this temperature until quite late in June or even as late as July. After the female has deposited the eggs she goes away from the nest but the male stays on guard to keep away fish and other enemies that would destroy them. He also fans the nest with his fins, thus keeping the water around the eggs fresh and pure. The adult bass doesn't incubate the eggs as a hen does. They hatch into little fishes as they lie on the nest and at quite a low temperature as compared with birds' eggs, but it is just as necessary that the male bass guard his nest when the eggs are hatching as it is that a hen guard and hatch her eggs. Some kinds of fish eggs can be hatched in hatcheries much as hen's eggs are hatched in incubators but this cannot be done with bass eggs. Sometimes the adult bass are put into artificial ponds where they build nests and raise their young just as they do in rivers and lakes under natural conditions.

The eggs of the bass are very tiny. It takes ten or twelve placed side by side to reach an inch but they contain yolk, just as a bird's egg does, on which the little fish lives after it is hatched and before it is able to get food for itself from the water. When the little bass is first hatched there is so much of the yolk

hanging in a little sac beneath it that it cannot swim. Subsequently this diminishes as the tiny fish grows larger, but until it is totally absorbed it continues to weigh him down so that he cannot escape from the many enemies such as perch, sunfish, catfish, snapping turtles, and many other hungry creatures in the water. If it were not for the male bass who guards them from their enemies while they are helpless, few of the newly hatched bass would ever grow to be very big.

AGENCIES DESTRUCTIVE TO BASS.

Competitor and Enemy Fish. Even with the male protecting them, many young bass may be destroyed if there are too many competitor or enemy fish in the water. Some of the enemy fish may get into the nest and destroy the eggs or young while the male is driving others away. Thus, if most of the bass are taken from a stream, and carp, suckers, pike, perch, catfish and other kinds of fish are allowed to increase, the few bass have an almost impossible task to keep these hordes away from their nests.

Floods are very destructive to bass. When forests covered the country the water which fell as rain or which resulted from the snow melting in the spring ran away slowly, being kept in the forest by the moss and leaves which acted as sponges to hold it and let it run away gradually. Then there were no serious floods because the water, being held back in the forest, came away gradually. The streams did not become low in summer and the water was always pure and cool.

Now that the forests have been cut down, the ground along many of the streams is left bare, and following a heavy rainfall the water runs away quickly, carrying with it much soil. The sediment-laden water of the much-swollen streams sweeps towards the lake, scouring out the bottom of the stream, destroying the nests of the bass, and carrying away the eggs. When the quiet water of the lake is reached, the sediment settles, burying the nests and smothering the eggs of the bass which have spawned in the lake. Following the flood, the water sinks to a very low level and in summer becomes very warm. All of these conditions are unfavourable to bass.

Deforestation. The removal of forests and of the thick beds of moss and leaves which cover the ground in forests is undoubtedly the cause of the disappearance of bass from many of our lakes. Even in July one sometimes finds ice under a bed of moss in a deep forest. A lake surrounded by such a forest is receiving trickles of ice-cold water all summer. With the forest removed,



MALE BASS GUARDING NEST AND EGGS

the ice and snow melts in the spring and the lake water becomes much warmer in summer than under original conditions. Sediment, too, is washed into the lake as suggested above, and the clean gravel becomes covered with mud. Such a lake is no longer suitable for small-mouthed bass.

Pollution—Bass are now unable to live in some waters where they were originally found because of pollution. Wastes from gas plants, mines, pulp and paper mills, creameries, and many other kinds of factories and mills are destructive to fish life. A substance need not be directly poisonous to fish to be deleterious. If it destroys any of the smaller animals or plants on which fish live, or removes the oxygen from the water, it will make fish life impossible. Sawdust may not be directly injurious to fish but if it covers the bottom so that bottom organisms are smothered or if it destroys the spawning grounds it will be destructive to fish life.

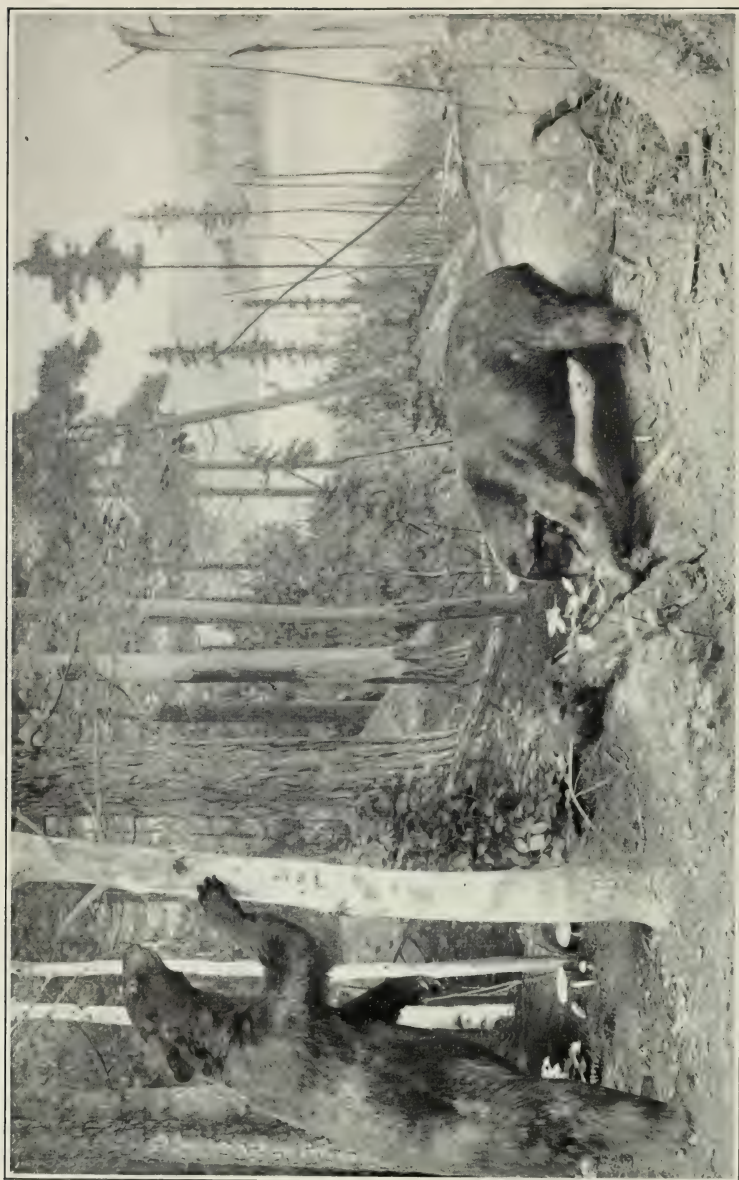
Illegal and Unsportsmanlike Fishing—Fishermen sometimes catch the male while he is guarding his nest. At that time he fiercely attacks anything that comes into the water near his nest. It is very thoughtless to fish for bass at that time. No one, worthy of the name of sportsman, will take unfair advantage of the fighting instinct which prompts the parent bass to protect its young in order to lure him to his destruction.

PERSONALS

THE increasing interest and support which the Museum is receiving is, we feel certain, only the beginning of great expansion in the immediate future should this be made possible in a physical way by the erection of a new wing to the present building.

Of very great value to the Museum is the service which the Honorary Curator of Ornithology, Mr. J. H. Fleming, is rendering. Mr. Fleming, whose reputation as an ornithologist is world wide, has one of the most extensive private collections of birds in existence as well as a very complete library of ornithological literature. The Museum is very fortunate in being able to avail itself at this stage in its existence of the advice and co-operation of a naturalist of Mr. Fleming's experience and standing.

Mr. John Edmonds is also rendering a great service to the Museum in giving almost his whole time without pay in assisting in the re-arrangement of the study collection of bird skins. Mr. Edmonds also accompanied the Museum party to Long Point last summer to assist in the natural history survey of the area, and is returning with the party again this spring.



GROUP OF BLACK BEAR, NORTHERN ONTARIO

ROYAL ONTARIO MUSEUM OF ZOOLOGY

PERSONNEL OF BOARD OF TRUSTEES

THE HONOURABLE THE MINISTER OF EDUCATION

THE HONOURABLE THE MINISTER OF MINES

THE CHAIRMAN OF THE BOARD OF GOVERNORS, UNIVERSITY OF TORONTO

SIR ROBERT FALCONER

SIR JOSEPH FLAVELLE, Bart.

COLONEL R. W. LEONARD

MR. J. B. O'BRIAN

MR. SIGMUND SAMUEL

MRS. H. D. WARREN

Chairman of the Board, Mr. J. B. O'BRIAN

Secretary of the Board, MISS HELEN REYNAR

Honorary Trustee, DR. ROBERT MOND

STAFF

B. A. BENSLEY, B.A., PH.D., F.R.S.C., Director.

E. M. WALKER, B.A., M.B., F.R.S.C., Assistant Director.

J. R. DYMOND, M.A., Secretary.

L. L. SNYDER, Technologist and Associate in Ornithology.

T. B. KURATA, B.S., Preparator.

E. B. S. LOGIER, Artist.

J. L. BAILLIE, Assistant.

H. P. STOVELL, Assistant.

J. H. FLEMING, Honorary Curator of Ornithology.

Mailing address:

253 Bloor St. West, Toronto.

Telephone:

Kingsdale 1531

ADMISSION

The Museum is open from 10 a.m. to 5 p.m. all week-days except Christmas Day and the morning of New Year's Day. It is also open Sunday from 2 p.m. to 5 p.m.

Admission is free Sunday, Tuesday, Thursday, and Saturday, and on all public holidays. On other days the admission fee is fifteen cents.

University students are admitted without charge on presentation of their registration cards.

All classes from the schools, art students, and study groups are admitted free.

Additional copies of this bulletin may be obtained, free, from the Department of University Extension, University of Toronto, Toronto 5, Canada.



ROYAL ONTARIO MUSEUM ON ZOOLOGY
BULLETIN No. 2

UNIVERSITY OF TORONTO, JANUARY, 1929



CHICKADEE AND WHITE-BREASTED NUTHATCH

This illustration of two of our commonest winter birds is reproduced from the original painting by Allan Brooks, which forms part of the Wallace Havelock Robb collection of Brooks's paintings in the Museum.



MAJOR ALLAN BROOKS, D.S.O.

Major Brooks, now recognized as one of the greatest of living bird artists, was born in India but came to Canada at an early age. He now lives at Okanagan Landing, B.C., in summer and at Comox, Vancouver Island, in winter. Major Brooks combines with his artistic ability a thorough scientific knowledge of bird life and is the author of numerous papers in the leading ornithological journals of England and America. Through the efforts of Mr. Wallace Havelock Robb the Royal Ontario Museum of Zoology now possesses a collection of 52 original paintings of birds of Eastern Canada by Major Brooks.

THE WORK OF MUSEUMS

THE modern museum which is fulfilling its function is a great educational institution for the public—a sort of people's university. It was owing to a recognition of the fact that museums were peculiarly adapted for certain phases of popular education that the movement for their establishment became so pronounced towards the close of the nineteenth century coincident with the movement for the popularization of knowledge.

But the popularizing of knowledge is not the only duty which museums recognize; they contribute an important share in the discovery of new knowledge. Their activities may therefore be summarized as (1) the acquisition and storage of materials and information, (2) the discovery of new knowledge, (3) the spread of knowledge, including publication and exhibition. Each of these lines of activity has many ramifications and involves a great deal of work of which the public has no direct knowledge. It is not generally known, for instance, that all properly organized museums have many times as many specimens in storage as on exhibition. The storage material is only in part a reserve supply for future mounting. Most of it forms the "study collection". The specimens in this collection are labelled with full information giving the place and date of capture and other information which future students may require. The arrangement, indexing, and care of study collections makes up no small part of the work of the curatorial staff. It is from the study of such extensive collections that new knowledge in ornithology, mammalogy, and other branches of natural science is derived. Studies in the field are, of course, necessary too, and these are obtained in part as a result of field surveys and from the observations of individual naturalists. Scraps of information from such sources as indicated above are carefully recorded and indexed and serve to build up the great body of natural history knowledge to whose advancement museums of zoology are dedicated.

Summer Field Work. Ornithological work was carried out during the past summer at Long Point, Norfolk County, Ontario, and at Ashbridge's Bay, Toronto. The results of these studies will be published in the Museum's Contributions series.

A museum expedition to southern British Columbia brought back practically complete collections of the amphibians, reptiles, and fresh-water fishes of that area. These are now being prepared for exhibition.

Results of Museum Surveys Published. The results of the museum's faunal surveys of the Lake Nipigon and Lake Abitibi regions have recently appeared. "A Faunal Investigation of the Lake Nipigon region, Ontario", including accounts of the mammals, birds, reptiles, and amphibians appeared in the Transactions of the Royal Canadian Institute, Vol. XVI, Pt. 2. "A Faunal Investigation of the Lake Abitibi region, Ontario" included accounts of the mammals, birds, reptiles, amphibians, dragonflies, and spiders. It was published as Biological Series No. 32, University of Toronto Studies. The publication of the latter paper was made possible by a donation by William Robertson, Esq. Reprints of these two papers are being distributed by the Museum as Contributions Nos. 1 and 2 of the Royal Ontario Museum of Zoology.

Coloured Reproductions Popular. The coloured reproductions of Allan Brooks' bird paintings mentioned in the first number of the Bulletin have attracted a great deal of attention and been the subject of much favourable comment. In the opinion of many no finer series of bird reproductions have yet appeared in America. In view of the fact that both the original paintings and the reproductions are of Canadian creation such praise is particularly gratifying. To meet the demand for these reproductions the museum has had to have an additional two thousand sets printed.

The Passenger Pigeon. A little more than fifty years ago the passenger pigeon occurred in Ontario in flocks that are said to have darkened the sun as they passed. To-day the species is extinct, the last specimen, so far as known, having died in the Cincinnati Zoological Gardens in 1914.

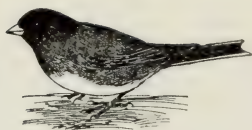
As late as 1870 some of the old nesting sites in Ontario were still frequented by large numbers of pigeons, but the almost incredible flocks of which Audubon and Wilson wrote had gone long before that date. By 1880 the pigeon was very scarce in Ontario, but a few specimens lingered on until nearly 1900.

The Museum is now trying to bring together as much information as possible on the subject of the passenger pigeon in Ontario. The men who knew the pigeon in the days of its abundance are rapidly passing, and we are trying to secure such information as still exists in the memories of these men before it is lost forever. In this work the museum is dependent on the co-operation of its friends in putting it in touch with persons possessing the information desired, and any of our readers who know of persons likely to possess such information are asked to send us their names and addresses.

The Paul Hahn Collection of Passenger Pigeons. In addition to bringing together information about the passenger pigeon, the Museum is anxious to preserve as many as possible of the mounted specimens of this extinct bird. Quite a number have already been brought together, largely through the interest and generosity of Mr. Paul Hahn. Most of those that remain in the possession of private individuals will sooner or later be destroyed or lost. Many of those possessing mounted specimens have the idea that they are very valuable. They are valuable in the sense that they are irreplaceable but they are not valuable in the sense that they can be sold for a great deal of money. The museum is not a commercial enterprise; it is the people's repository for the preservation of specimens, materials, and information of scientific and cultural value. For this reason we hope that persons having mounted specimens of the passenger pigeon will either donate them to the Museum or part with them at a nominal price.

WINTER BIRDS

WHEN fall days have come and gone and the straggling rear guard of greened, greyed, and buffed bird migrants has left our woods and fields for the winter, it may appear that the bird student's year has ended. The out-of-doors will be bleak and



JUNCO

cold and, compared with spring, the trail will seem utterly abandoned by wild life. Nowhere will one hear a constant flood of song, such as is so evident in spring when the mating impulse brings birds into full chorus. The few birds that are still with us have their activities reduced to a minimum. The pulse of nature is slowed to a sleeping tempo.

However, the bird student need not wait for spring and its host of colourful migrants. There are plenty of things to see in winter. In and about Toronto from fifteen to twenty species of birds may be seen on a winter day during a two or three-hour hike. In fact, if a notebook is kept, as should be done, one may find that forty different kinds of birds have been seen during a single winter. Considerably more than that number appear on the records of winter birds in the files of the Museum but, of course, these cover a period of more than forty winters.



TREE SPARROW

For the beginner the winter may be the best season for the reason that there are fewer species to learn to recognize. The bare condition of trees and thickets with the resultant increase of visibility is ideal for viewing the characteristic markings of birds and acquiring the deftness necessary in keeping such spirited objects as birds within the field of the binoculars.

In the study of ornithology the first requirement is to be capable of recognizing the various species of birds and to designate them by a generally accepted name. This knowledge is best obtained in the field and from books, although these sources may be supplemented by visits to the Museum. Additional information about birds—where and how they live—will come through increased familiarity with them in the field, one's powers of observation and deduction increasing through experience.



HORNED LARK

The segregation of the various kinds of birds by habitat boundaries will be noted early in the beginner's experience. The winter birds of Toronto illustrate this feature very well. They may be divided into four convenient groups.

Birds of the City Streets. The House or English Sparrow, which is so well known to everyone, is the only species which appears regularly and in numbers about the city streets in winter. It is a foreign bird which was introduced into North America in 1851, subsequently spreading to nearly every inhabited part of the continent. The Starling, another importation which was brought to the new world in 1890, is spreading rapidly and may be seen about certain sections of Toronto in winter and is almost certain to be a common bird of the city streets in the near future.



BROWN CREEPER

Birds of the Roadside and Scrubby Fields. Surrounding the city are many open plots and unpaved roads where weeds, bushes, and stunted trees afford protection and food to some kinds of winter birds. The Slate-coloured Junco may be seen there in flocks, feeding upon the ground and rising like wind-blown leaves to give their flash-signal—an instantaneous spreading of the tail exposing the pure white outer tail feathers. Here, too, may be found a flock of Tree Sparrows feeding among the bushes. The indistinct but ever-present dark dot on the centre of the grey breast is a convenient mark of identity. The Northern Shrike and the



DOWNY WOODPECKER

Horned Lark are other species which frequent such situations. The former appears as a black-and-white bird as it flies from one shrub to another. It is of especial interest since it kills and eats mice, although related structurally to the song birds. The Horned Lark, although a migrant, returns to our fields and

waste lands before winter is over, and in February may be seen running over bare spots in the road or fields. Perhaps you may be favoured with its tinkling, musical song if the day is sunny and it feels so inclined.

Birds of the Woods. In the many wooded parks and ravines in and about Toronto one is certain of seeing or hearing several kinds of winter birds. The diminutive Brown Creeper may be found probing with its sharp, curved bill into the bark-crevices of trees, from base to bough, for insect eggs or "sleeping" pupae. Two species of woodpeckers, marked with black and white, may be found searching dead and infected trees and branches for grubs. The smaller, the Downy



BLUE JAY

Woodpecker, is almost an exact replica of the larger, the Hairy Woodpecker; even their notes are similar except in volume. If you note a patch of red feathers on the back of the head of any individual it is the male of the species, the female having this colourful note omitted from her plumage. You may hear the



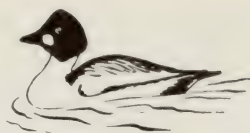
OLD SQUAW

boisterous cry of the Blue Jay, which needs no description other than its name, except that the feathers of its head form a crest. Another species which may be met with is the White-breasted Nuthatch. Its position, as it makes its jerky, zig-zag course, head foremost, down a tree trunk, may hide its white breast, but you will note the blue-gray back and the black top of its head. The Black-capped Chickadee may himself announce his name, "Chickadee-dee-dee" but, if you would solicit his intimacy, imitate his high-pitched whistle, "Pee-weedee", and he will leave his business of food-hunting and come down to see you.

Birds of the Water Front. At Ashbridge's Bay, Toronto Bay, Exhibition Park, and at Sunnyside, open water is usually to be found in winter. Gulls and ducks find these places suitable

winter resorts and consequently the bird student may add to his list by visiting the water-front. Herring Gulls, which are usually the most numerous birds in such places, are white with light, blue-grey backs

and black outer wing feathers. Immature birds are dark greyish brown. Flocks of Old Squaw ducks, a long-tailed species which summers in the Arctic, may be seen swimming and diving in the icy water. The males are conspicuous with their white heads and necks marked with a dusky spot on each side. The females are less strikingly marked, but are usually associated with the males. Two other species of ducks may be noted quite commonly, the Merganser and the Golden-eye. The general colouration of the males of these two species may appear very similar at a distance, both being patterned with black and white, but the Merganser's dark head is unmarked and his bill is narrow, while the Golden-eye has a rounded white spot at the base of his typical broad duck bill on both sides of his proportionately large



GOLDEN-EYE



MERGANSER

head. The females of these species, although both coloured with grey and brown, are not likely to be confused.

L. L. S.

Aids to Bird Study. "Birds of Eastern Canada", by P. A. Taverner, a 300 page book illustrated with coloured plates and cuts, will be found very useful by anyone interested in bird study in Eastern Canada. It may be purchased from Mr. Wyatt Malcolm, Geological Survey, Ottawa, for fifty cents in board or one dollar bound in cloth.

Pamphlets on "Attracting Birds with Food and Water" and "Bird Houses and their Occupants" may be had, free, on application to The Canadian National Parks Branch, Department of the Interior, Ottawa.

The Spread of the European Hare in Ontario. The spread of the large European hare throughout southwestern Ontario is provid-

ing a good deal of sport in a region formerly almost destitute of game. This animal is generally called Jack Rabbit, an entirely erroneous and misleading name. Jack Rabbits are natives of western America, whereas this newcomer is a native of Europe and should be called the European Hare. It was first introduced at Brantford, Ontario, in 1912. In February of that year Mr. Otto Herold, then manager of the Bow Park Farm near Brantford, imported from Germany seven females and two males of the hare common to Central Europe (*Lepus europeus*). At first they were kept in an enclosure but they soon made their escape and within a few years had spread over quite a large area of southern Ontario. Recent inquiries conducted through the co-operation of the District Representatives of the Ontario Department of Agriculture and others show that this species now extends into Kent on the southwest, Bruce and Grey on the northwest, Simcoe on the north and Ontario County on the east. They are naturally commonest near the centre of introduction and in the counties of Oxford, Middlesex and elsewhere afford considerable sport in an area where previously the cottontail rabbit was almost the only game animal.

In some districts organized hunts are conducted throughout the winter, with the twofold object of sport and of keeping the species within reasonable limits numerically. Roger Hedley of Ilderton (Middlesex County), Ont., says that up to February 7th, 1928, 300 of these hares had been killed in an area of six square miles during the past winter and that many still remained. Later he reported that on Feb. 18th seven men hunting over an area of a little more than one square mile had killed 10 hares and had seen 80 others. Mr. G. R. Green, Agricultural Representative of the Ontario Department of Agriculture in Oxford County, reported that in East Nissouri township in organized hunts which are held each Thursday throughout the winter, 218 European hares had been killed by the end of December of last year and that 86 had been killed in the last drive. Similar hunts are carried out in many localities in the counties surrounding the area of original introduction.

Mr. Henry Howitt, writing in the "Canadian Field Naturalist" (Oct., 1925), described their habits when hunted as follows: "'Big Jacks' are usually found in fields, although when chased

by dogs they will often run through a wood, and from one wood across fields to another, possibly in an endeavour to get out of sight of the hounds, but I have never known one, when chased, to pause to hide in the shelter of the trees. To hit one which suddenly jumps up a few feet in front of you and rushes off like an express train requires more skill and coolness than to shoot a native hare (*Lepus americanus*) as it ambles leisurely along the aisles of cedar." He adds: "I have never known a dog to run down a 'big Jack,' which soon leaves the dog far behind."

This hare does not appear to have become seriously injurious to crops in Ontario as yet. The injury most commonly reported is that to fall wheat. They are said sometimes to eat off the plants in patches varying in size from one to several feet. Less often they are accused of girdling young fruit trees and in Welland they are said to be destructive at times to market garden crops. On the whole, surprisingly few complaints are heard against these hares on the ground of their destructiveness.

This animal also occurs in the eastern United States, where it was liberated on a number of occasions, one at least as early as 1888. There it has proved to be seriously injurious at times to young orchard trees. James Silver reported in the "Journal of Agricultural Research," Vol. 28, No. 11, that every tree in one orchard of 200 large five-year-old apple trees had been badly damaged, and it was estimated that the losses in Dutchess County alone during the winter of 1915-16 exceeded \$100,000.

The European hare is a much larger animal than either our native hare or the cotton-tail rabbit, at times reaching a weight of twelve pounds or even more. Many regard them very highly as food. On account of their size and numbers the amount of meat represented by this hare in Ontario is considerable. Many of the animals killed in Ontario are eaten or sold in the towns and cities. Some are fed to poultry and foxes, but many are said to be left in the fields where they are killed. If there is a market for them it is a shame to permit any of them to be wasted.

J. R. D.

PERSONNEL OF BOARD OF TRUSTEES

THE HONOURABLE THE MINISTER OF EDUCATION
 THE HONOURABLE THE MINISTER OF MINES
 THE CHAIRMAN OF THE BOARD OF GOVERNORS, UNIVERSITY OF TORONTO
 SIR ROBERT FALCONER
 SIR JOSEPH FLAVELLE, Bart.
 COLONEL R. W. LEONARD
 MR. J. B. O'BRIAN
 MR. SIGMUND SAMUEL
 MRS. H. D. WARREN
Chairman of the Board, MR. J. B. O'BRIAN
Secretary of the Board, MISS HELEN REYNAR
Honorary Trustee, DR. ROBERT MOND

STAFF

B. A. BENSLEY, B.A., PH.D., F.R.S.C., Director.
 E. M. WALKER, B.A., M.B., F.R.S.C., Assistant Director.
 J. R. DYMOND, M.A., Secretary
 L. L. SNYDER, Technologist and Associate in Ornithology.
 T. B. KURATA, B.S., Preparator.
 E. B. S. LOGIER, Artist.
 J. L. BAILLIE, Cataloguer
 H. P. STOVELL, Assistant.
 J. H. FLEMING, Honorary Curator of Ornithology.
 JOHN EDMONDS, Honorary Associate in Ornithology.

Mailing address:
 253 Bloor St. West, Toronto.

Telephone:
 Kingsdale 1531.

ADMISSION

The Museum is open from 10 a.m. to 5 p.m. all week-days except Christmas Day and the morning of New Year's Day. It is also open Sunday from 2 p.m. to 5 p.m.

Admission is free Sunday, Tuesday, Thursday, and Saturday, and on all public holidays. On other days the admission fee is fifteen cents.

University students are admitted without charge on presentation of their registration cards.

All classes from the schools, art students, and study groups are admitted free.

Additional copies of this bulletin may be obtained, free, from the Department of University Extension, University of Toronto, Toronto 5, Canada.

ROYAL ONTARIO MUSEUM OF ZOOLOGY

BULLETIN No. 3

UNIVERSITY OF TORONTO, JUNE, 1929



THE PASSENGER PIGEON

The original painting by Allan Brooks from which this picture is reproduced was presented to the Museum by Paul Hahn, Esq.

A BRIEF OUTLINE OF THE HISTORY OF THE PASSENGER PIGEON

BY

MARGARET H. MITCHELL

"Now extinct". What a fascination these words hold! They conjure up pictures of vanished races—the Incas of Peru, the Aztecs with their extraordinary temples and weird gods, or of creatures of the more distant past, such as the great dinosaurs which once roamed through what is now the Canadian West, or those queer reptiles, the pterodactyls, which flew through the air and swam through the seas of the Mesozoic era.

How easy it is to embroider the life-histories of such vanished creatures with myth and legend, to allow the imagination to carry away any sense of proportion and so distort good wholesome facts. Yet there is one creature, "now extinct", about which the plainest statements are fairly breath-taking, and that is the passenger pigeon.

This bird once flocked in enormous numbers over a great extent of the North American continent, from the Gulf of Mexico to Hudson's Bay, and from the eastern sea coast to the Rocky Mountains. Perhaps no land creature has ever existed in such numbers over so large an area.

Many men now living remember the pigeon and its spectacular migration flights, and their stories often seem incredible enough to us who have seen only a few mounted specimens in a museum. But when we look up old records it is clear that these tales are not only true, but are even conservative when compared with some early accounts.

EARLY RECORDS

What is apparently the first mention of the passenger pigeon is found in "The First Relation of Jacques Cartier of S. Malo", 1534, where it is said that the explorer found "stockdoves" at what is now Cape Kildare in Prince Edward Island; and he records them also from the St. Lawrence on his second voyage

of 1535-1536. These are, of course, mere passing notes, but they are interesting because of their early date.

Later on, in the next century, the "Jesuit Relations" of 1610-1613, telling of conditions in Acadia, give this picturesque account: "The birds are fully as abundant as the fishes. During certain months of the year pigeons sally forth from the woods into the open country in such great numbers that they overload the branches of the trees. When they have settled upon the trees at night they are easily captured and the savages heap their tables with royal abundance."

Later still, toward the middle of the seventeenth century, one John Josselyn, gentleman, made two voyages to New England and in his record of the second voyage, he gives this account of the birds: "the pigeons of which there are millions of millions. I have seen a flight of pigeons in the Spring, and at Michaelmas when they return back to the Southward, that to my thinking had neither beginning nor ending, length nor breadth, and so thick that I could see no Sun. They join Nest to Nest and Tree to Tree by their Nests many miles together in Pine-Trees. I have bought at Boston a dozen pigeons ready pulled and garbided for three pence. But of late they are much diminished, the English taking them with nets."

It is interesting to note that, even in those days, over two hundred and fifty years ago, the pigeons were regarded as being much diminished.

It is clear from these old records that the pigeons were a truly important item in everyday life; they were noticed, and noticed in detail, by people with no particular bent for natural history. So we may, with confidence, expect to find very much fuller and more glowing details in scientific writings.

Alexander Wilson, in the early nineteenth century, gives a very famous description of the birds and their habits. He describes a great flight which extended as far as he could see, and continued over his head for more than three hours, and was followed by smaller flocks for another two hours. He says: "They were flying with great steadiness and rapidity at a height beyond gunshot in several strata deep, and so close together that could

shot have reached them one discharge could not have failed of bringing down several individuals." This tremendous procession he estimated as containing 2,230,272,000 pigeons!

He gives another vivid description thus: "A column, eight or ten miles in length, would appear from Kentucky, high in air, steering across to Indiana. The leaders of this great body would sometimes gradually vary their course until it formed a large bend of more than a mile in diameter, those behind tracing the exact route of their predecessors. This would continue sometimes long after both extremities were beyond the reach of sight, so that the whole, with its glittery undulations, marked a space on the face of the heavens resembling the windings of a vast and majestic river."

NESTING AND DESTRUCTION

Imagine the nesting of such a multitude! They chose usually hardwood trees for their nests in great tracts often several miles wide by thirty or forty miles long. Here extraordinary sights were to be seen. Branches broke from the trees, too heavily laden with nests and birds. All vegetation was completely killed by the birds' excrement. The constant flutter of wings and the calling of the birds made a deafening noise, and when the flocks left daily for their feeding grounds the sound of their wings was as of thunder.

Nesting sights such as this, on perhaps a somewhat smaller scale, were to be found in the last great fortress of the pigeon, the State of Michigan, as late as 1880. In the years prior to this their slaughter had been almost beyond belief. Naturally a creature which existed in such numbers and in such a spectacular manner, was bound to be the target of sportsmen and the professional market hunter, (these latter coming into existence about 1840). They were killed in large numbers during migration, but the greatest destruction took place when the nests were filled with squabs. Every man and boy in the vicinity of a rookery turned out with stick, gun, sulphur pot, torch and net; and the professional came many miles prepared to export his catch

by barrel, and in later years, by freight car-load, to the markets of the great cities.

These pigeoners used nets largely and caught incredible numbers in this way. Many startling figures may be found in old articles on the subject. Sixty to ninety dozen birds per net per day was considered a fair average. One man is reported as having caught and delivered two thousand dozen pigeons in ten days. An article written on this subject in 1879 gives some interesting figures—"The prices of dead birds range from 35c to 40c per dozen at the nesting. In Chicago markets 50c to 60c. . . . Live birds are worth at the trapper's net 40c to 60c per dozen; in cities \$1 to \$2 From the above quotations a pencil will quickly figure out an income of \$10 to \$40 per day for the trapper. . . . One 'pigeoner' at the Petosky nesting was reported to be worth \$60,000, all made in that business." A profitable business surely, for in 1879 \$60,000 was a considerable sum of money!

OCCURRENCE OF PASSENGER PIGEON IN ONTARIO

The history of this bird in Ontario is not quite as spectacular as that of its life farther south, but is nevertheless very interesting. Recently a somewhat intensive investigation on this subject has been carried out by the Royal Ontario Museum of Zoology, with the result that much useful and valuable information has been collected. Some of it is particularly valuable in that it was contributed by men who actually knew the bird while it was still abundant; and the Museum feels that it is its duty to bring together as much of this irreplaceable knowledge as possible before it is too late.

One of the earliest references of any length to the pigeon in Ontario is in the writings of Isaac Weld, Jr., of his "Travels through the States of North America", 1795-1797: "A gentleman of the town of Niagara assured me that, once as he was embarking there on board ship for Toronto, a flight of them was observed coming from that quarter; that, as he sailed over Lake Ontario to Toronto forty miles distant from Niagara, pigeons were seen flying overhead the whole way in a contrary direction

to that in which the ship proceeded; and that, on arriving at the place of his destination, the birds were still observed coming down from the north in as large bodies as had been noticed at any one time during the whole voyage; supposing, therefore, that the pigeons moved no faster than the vessel, (Note—They flew as fast as 60 miles per hour) the flight, according to this gentleman's account, must at least have extended eighty miles It is not oftener than once in seven or eight years, perhaps, that such large flocks of these birds are seen in the country."

There are records of the pigeon having nested in Ontario, from Essex county to Moose Factory, and from Nipigon, Thunder Bay District, to Ottawa; but it is in a few districts only that they came in numbers which in any way approximated the Michigan rookeries.

Perhaps the most important of these was along the shores of Lake Huron. Here the birds came in great numbers for many years, sometimes in one locality, sometimes in another. Major Strickland, one of the earliest settlers of the "Huron Tract", writes of them being very plentiful near Goderich in 1829. He says: "They happened to be uncommonly numerous . . . I had a large fowling-piece with a wide bore . . . bagging seven birds at the first shot . . . they flew in such thick clouds." In that same year or the year after, 1830, he tells of camping with a friend, Dr. Dunlop, near a nesting site. They could not sleep at night for the noise of the birds, and towards morning the birds left for their feeding grounds with an incessant roaring of wings, this departure lasting two hours.

Another gentleman, now living, Mr. Wm. Welsh of Kincardine, recalls them in the same region about the year 1854. He says in the *Canadian Field-Naturalist*, October 1925: "As the day wore on the pigeons surprised us, they came in such large numbers. But this seemed accountable because of the enormous crop of beech-nuts of the previous year I have seen the flocks at times following one another so closely that at least one-third of the space seemed filled with pigeons, and this would continue for days. In later years, as the clearings were enlarged, I have seen a flock of hundreds light on a wheat field, with the

result that the crop was soon a dead loss There was a pigeonry convenient to our farms, only about six miles away, and this was said to extend eleven miles in one direction and thirteen in another."

This mention of a flock settling on a field of wheat brings to mind the interesting way these birds had of feeding on the ground; the rear of the flock continually rose up and flew ahead to settle on an ungleaned portion so that the whole gave the appearance of a revolving cylinder. Chief Justice Latchford gives a very vivid description of this habit: "I once saw a large flock feeding in a pea field between me and the sun, low, but bright. The splendid iridescence of their plumage thus received a new glory. Every bird was moving, those left in the rear where the gleaning had been gathered, flying over those in front in a constant progression. The vivid colours, flashing wings, and rapid and graceful motion combined to produce a scene that is vivid in my memory to-day, after a lapse of more than fifty years."

SOME INTERESTING REMINISCENCES

Many such reminiscences have been received in response to the request for information sent out by the Museum. It might, perhaps, be of interest to quote from some of them, for many recall places gone or changed out of recognition and all record scenes which can never, by any possibility, be repeated.

Mr. Geo. A. Phillips of Welland writes: ". . . Still west of this block of timber was a large tract of woods containing perhaps a thousand acres, on which pine, chestnut, white oak, and beech predominated. This section was known as a 'Bob Town', and a small part of it still goes by the same name yet, though the greater part of it is now called Chantler. In this locality there were countless numbers of nests, most of them built low down as before mentioned. The pigeons generally arrived in the early part of May, though they are said to have appeared some years in early April. They feasted on the beech-nuts, acorns, and chestnuts, scratching the leaves off, and there would be immense numbers of birds which, when suddenly alarmed, would rise

with a roar like a passing train. Then along towards sunset they would flock south to the great huckleberry marsh, about four miles distant, to roost over night in the tamaracks, and return each morning to their favourite feeding grounds."

In writing about the pigeons in the neighbourhood of Priceville, Grey County, Mr. S. L. Wright, now of Uxbridge, says: ". . . . The birds lived principally around the fields and were very destructive, sometimes boys had to be kept from school to keep them from destroying the crops; and when the grain was cut, and in shocks, I have seen hundreds of shocks so covered that you could see nothing but pigeons. This was where we did execution, although we had nothing but old muzzle-loaders. . . . My next-door neighbour who made shingles by hand down in a little swamp near the river, when he would be eating his lunch, threw food to them, and they would come down out of the trees and struggle in such numbers that he threw sticks into them, and sometimes he would have a dozen in each hand coming home that he had killed during the day." This gentleman says they were considered next in excitement to the Fenian Raids!

From Mr. N. Pearson of Aurora came a very full and interesting account from which the following extracts are taken: "I have seen them in flight, no doubt in the millions, by standing on the streets in the little hamlet of what was then Mitchell's Corners, now the town of Aurora, and looking south towards the Oak Ridges a mile and a half away, a line of birds creeping up over the tree tops with apparently no end. . . . My memory goes back as far as 1850 when as a boy I carried on to the best of my ability a relentless warfare of destruction on the innocent creatures, more in habit than in intention or wickedness." He also tells of them nesting in vast numbers at a place called Pine Orchard northeast of Aurora, and of them being slaughtered there by farmers from the country round about; and, too, how his grandmother pickled and smoked them for winter use, in the days when settlers were dependent on wild things for food.

An account of particular interest to Toronto people is given by Mr. John Townson, in a paper which he read recently before

the Brodie Club at the Museum. After telling of seeing a flock of pigeons in the Don Valley near the present site of the Bloor Street viaduct, he says: "Also at that time (1864) there was a large tract of open ground extending from St. James' cemetery over to the end of Bloor Street where the old block-house stood on the crest of the ravine where the Sherbourne Street bridge is now located. This open stretch of ground was a favourite place for the local gunners to wait for the pigeons as they lowered down after passing over the city and for many years was known as 'Pigeon Green'." Again he says: "The number of the birds that visited the vicinity of Toronto in the spring varied greatly, but in 1876 I saw a greater number of wild pigeons in one vast flock than I ever expected to see. One morning about the middle of April . . . I happened to be on Toronto Island near the Eastern channel, when I noticed what I supposed to be an immense black cloud over the lake to the southeast moving towards Scarboro Heights, but as there was a moderate wind blowing I could not figure out how the cloud was moving against the wind. However, I did not have long to wait as the moving mass changed its course and swung to the westward, and in a few minutes the northern edge of the flock was directly overhead, and I found myself gazing at an innumerable flock of wild pigeons . . . I took out my watch and that flock kept passing over my head for fourteen minutes. I think if my father had been there (reluctant as he was to use the word millions) he would have broken his rule that time. I could plainly hear the rushing sound made by the wings until the birds passed out of sight."

Another interesting item concerning Toronto is that at one time there was a small lake lying in the University grounds to the south of the present site of the museum and here "in the quiet of the park" many pigeons could be seen in the spring, feeding on acorns and drinking at the lake.

Many men in answering the questionnaire sent to them found the small space allotted to each question insufficient for their answers. They would start out prosaically enough with facts—dates and sites of breeding colonies, time of arrival each year, number of eggs in a nest—but as memory came flooding back

they waxed quite eloquent and overflowed the space given, some into quite long descriptions taking up many pages of paper. In these they gave evidence, in vivid word pictures, of how great an impression the advent of these birds had made upon them.

For instance: "In 1869 (I was four years of age) when going in the company of my father through the beech woods in Central Pennsylvania, a flock on the ground and in the trees nearly smothered us. It was twenty or thirty minutes before we could breathe freely. They came as an avalanche over us, ran into us, and covered us with filth. It is one of the first things I can remember, and I remember father putting me between his legs and telling me to stop crying, it would soon be over. The occurrence is so vivid in my memory that I could sketch the man with a gun near us, and his pile of dead birds three feet high." Or this impression of another man: "There were so many on the ground it looked blue; when they flew up on the trees it seemed like the whole ground was a-raising." Or this picturesque note which has a decidedly biblical rhythm: "They clouded the sun in their flight and shadow after shadow passed on the fields."

Here is one from a very old gentleman who lived when a boy in Huron County: "Some settlers blessed the pigeons and were thankful to Providence for such a free gift of food. Others stuffed themselves with pigeon pie, and cursed and swore because the poor birds trespassed on their fresh-seeded fields, ungrateful as the Israelites of old when they were so bountifully supplied with quail."

And this last one brings a smile when one thinks how many years a reproving parental remark has remained clear in a man's mind: "Your correspondent constructed one trap about four feet square. It was not a great success, caught only one bird, and father said it was a waste of nails, and perhaps it was, as the pigeons did not stay around many days."

MARKETING OF PASSENGER PIGEON IN ONTARIO

In regard to the marketing of pigeons in Ontario the consensus of opinion seems to be that they did not occur, within the memory of men now living, in any great commercial quantities. They

were shot largely for sport and domestic use, though in some of the more southern counties they were shipped by the barrel to markets in Buffalo, Toronto, Montreal, and other smaller centres. This latter was done on a very much smaller scale than in the States, as a comparison of figures will show. There, as stated before in this article, an average catch per day at a large nesting ranged from sixty to ninety dozen, whereas in Ontario the highest figures given were three or four barrels daily, each containing about one hundred birds; this giving seven hundred to one thousand individuals as against three hundred to four hundred here.

DISAPPEARANCE

To many people one of the greatest mysteries in connection with the passenger pigeon is its apparently sudden disappearance. It seemed as though one year they were abundant and the next they were gone completely. This is quite true in appearance, but as the date of the "last year" varies for different localities the mystery seems easily explainable.

As was stated before, John Josselyn, gentleman, about 1650, was told that they were much diminished, and this seems to have been the tale ever since. Each generation found them amazingly numerous, but not what they had been in the "good old days", until toward the end of the last century they were reduced to a few scattered flocks which appeared here and there at irregular intervals. Their death blow seems to have been dealt at the great Michigan nesting of 1878, after which their numbers rapidly dwindled until by 1900 they were gone in the wild state. A few struggled on in captivity, but quickly died out. The last survivor of the once innumerable species died in the Cincinnati Zoological Gardens in 1914.

Such is the pathetic ending of a great saga. Legislation and popular opinion came too late to save the passenger pigeon. It seems more than regrettable that we should have been deprived of the sport and pleasure provided by these birds. We may belong to a materialistic and practical age which would not have tolerated the destruction of grain and other field crops, but I

think we are still capable of appreciating beauty of form and movement. Certainly we would have enjoyed basking in the glory of "the greatest flocks of birds in the world" in this day of superlatives. But these pleasures can never be ours with this handsome bird completely engulfed in the limbo of lost things.

NOTES ON ONTARIO SNAKES

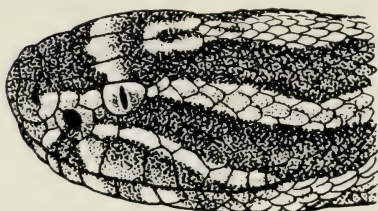


Fig. 1

Fourteen species of snakes are known to occur in Ontario at the present time, and of these only one, a small species of rattle-snake known as the Massasauga is poisonous. All the other species are harmless, while many of them are use-

ful since they destroy mice and injurious insects.

Even the Massasauga (fig. 1), though venomous, is a quiet, good-tempered species which much prefers to glide away than to quarrel and there are very few records of injury to man by this snake even where it is common. It is still found in Bruce peninsula, on the eastern shore of Georgian bay, and in a few other localities farther south. It frequents more or less swampy situations and feeds upon mice and frogs and occasionally on birds. It should not be handled carelessly because its bite may easily prove fatal.

The timber or banded rattlesnake, a larger species which formerly occurred in Ontario is probably now extinct in Canada.

There are no Copperheads or Moccasins in Ontario. The common water snake (Fig. 4) seems to be often confused with the water moccasin (Fig. 2) and called by that name, and is very generally but erroneously dreaded as being venomous. It is in reality perfectly harmless. The name "copper-head" seems to be indiscriminately applied to various harmless

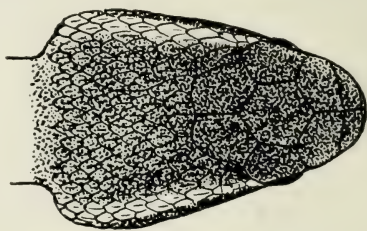


Fig. 2

snakes including even DeKay's brown snake, a diminutive and innocent species. The true copperheads and moccasins are venomous snakes with stout bodies, thin necks, and triangular heads. They belong to the rattlesnake family and are shaped like them, except that their tails taper to a point, without rattles.

The fox snake or "womper", and the milk snake, both harmless and very useful species, often fall as victims to ignorance and superstition. Both of these snakes are brightly coloured and vibrate the ends of their tails when frightened or molested. The fox snake is even believed to sting with its tail and the milk snake is supposed to steal milk from cows. These beliefs are too foolish even to be funny and the snakes in question are utterly harmless. They destroy large numbers of mice and young rats, searching out the nests and devouring whole litters, and it is for this purpose that they visit farm buildings.

The milk snake is a slim-bodied species with smooth scales, which attains a length of three feet or more. It is of ashy or brownish ground colour above, marked with large brown blotches conspicuously margined with black. The fox snake, which reaches a length of six feet, is deep yellowish or pale brown above with large, roundish, dark-brown blotches, not conspicuously margined with black, and there is a low ridge or keel down the middle of each scale.

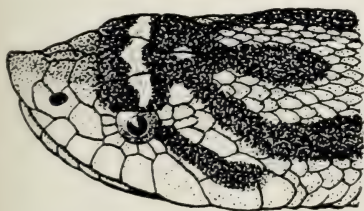


Fig. 3

The hog-nosed snake or "blowing adder" is another harmless species which is often killed as venomous because of its menacing appearance. When frightened or molested, this snake flattens its head and neck and hisses

loudly, striking at its tormenter, hence the names "blowing adder" and "puff adder". It is supposed by some people to be so venomous that even its breath is poisonous. However, in spite of its antics and threatening appearance it is a perfectly harmless and gentle species and will not even bite when

handled for the first time. The hog-nosed snake is a thick-bodied species which grows to about three feet in length. It is variably coloured, sometimes very dark, but may be distinguished from all our other snakes by the shape of its snout which is pointed and up-turned at the tip. (Fig. 3).

The garter snake is the commonest and widest-ranging of all our snakes, and also the hardiest. It is the first snake to appear in the spring, and the last to disappear in the fall. It frequents ponds, streams, marshes, meadows, open woods, and dry pastures and hillsides, feeding upon insects, earthworms, frogs, and fish according to its habitat, and occasionally on young birds. It is black, greenish or brown above with three light yellow or greenish stripes, one down the middle of the back and one along each side.

Closely allied to the garter snake is the ribbon snake, a much slimmer-bodied species in which the three light stripes are sharp, clean-cut, and vivid yellow. It frequents the grassy banks of ponds and streams and climbs into low bushes. It is rather aquatic in its habits and feeds on small frogs, tadpoles, and salamanders.

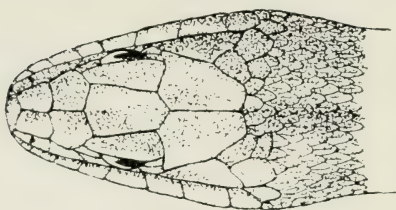


Fig. 4

The water snake is a common species and the most aquatic of all our snakes, spending its life about quiet streams, ponds, and marshes where it may be seen basking on the banks or upon tree stumps or floating logs. It is an expert swimmer and diver

and feeds upon fish and frogs. In colour it is brownish or reddish, with dark cross-bands which break into alternating blotches on the hinder portion of the body. In old specimens the banding is obscure, and the colouration often very dark. This phase is commonly spoken of as a "black snake".

Closely related to the water snake, but not common, is the queen snake which is found in similar habitats in some of the southern counties. It is brown above with a bright yellow band along each side.

DeKay's brown snake and the red-bellied snake are small species found about dry, open woods and meadows, hiding beneath logs or stones during the day. They feed upon insects, slugs, and earthworms. The brown snake, which grows to twelve inches in length, is brown above with a lighter dorsal band, and pale, faintly pinkish beneath. The red-bellied snake which grows to ten inches is also brown above, but has a bright red belly, margined on the sides with dark speckling. It has a bright yellow spot on the back of the neck.

The green snake and ring-necked snake are smooth, satiny, and very beautiful species. The green snake, which wanders in grassy fields and climbs into bushes and vines, feeds upon insects and spiders. It reaches a length of twenty inches, is uniform smooth green or olive above, and pale yellow beneath. The ring-necked snake which reaches a length of eighteen inches, is gray or olive above and pink or orange beneath, and may always be recognized by the bright ring around its neck. It inhabits woodlands, hiding during the day beneath the loose bark of logs or under cover on the ground. It feeds on insects, worms, small salamanders, and other snakes.

The blue racer or black snake, and the pilot snake, are large species occurring in the extreme southwest of the Province. They attain lengths of six and eight feet respectively, and feed upon small mammals, frogs, birds, and eggs. They are harmless and timid creatures in spite of many stories to the contrary.

The indiscriminate killing of all snakes should be discouraged. These creatures have their places to fill in the scheme of nature and some of them are highly beneficial and useful to man by reason of their destruction of mice and injurious insects.

Aversion to snakes is largely acquired through training and legend, and can in most cases be overcome. When this is accomplished these interesting creatures become fascinating objects of study, illustrating in their structure, life-histories, and adaptations, many important biological principles. And, after all, they are a part of nature just as truly as are birds and trees, expressions of the same vital energy which animates all living things, and with an equal right to live.

E.B.S.L.

ROYAL ONTARIO MUSEUM OF ZOOLOGY

PERSONNEL OF BOARD OF TRUSTEES

THE HONOURABLE THE MINISTER OF EDUCATION
THE HONOURABLE THE MINISTER OF MINES
THE CHAIRMAN OF THE BOARD OF GOVERNORS, UNIVERSITY OF TORONTO
SIR ROBERT FALCONER
SIR JOSEPH FLAVELLE, Bart.
COLONEL R. W. LEONARD
MR. J. B. O'BRIAN
MR. SIGMUND SAMUEL
MRS. H. D. WARREN
Chairman of the Board, MR. J. B. O'BRIAN
Secretary of the Board, MISS HELEN REYNAR
Honorary Trustee, DR. ROBERT MOND

STAFF

B. A. BENSLEY, B.A., PH.D., F.R.S.C., Director.
E. M. WALKER, B.A., M.B., F.R.S.C., Assistant Director.
J. R. DYMOND, M.A., Secretary.
L. L. SNYDER, Technologist and Associate in Ornithology.
T. B. KURATA, B.S., Preparator.
E. B. S. LOGIER, Artist.
J. L. BAILLIE, Cataloguer.
H. P. STOVELL, Assistant.
J. H. FLEMING, Honorary Curator of Ornithology.
JOHN EDMONDS, Honorary Associate in Ornithology.
Mailing address: 253 Bloor St. West, Toronto. Telephone: Kingsdale 1531

ADMISSION

The Museum is open from 10 a.m. to 5 p.m. all week-days except Christmas Day and the morning of New Year's Day. It is also open Sunday from 2 p.m. to 5 p.m.

Admission is free Sunday, Tuesday, Thursday, and Saturday, and on all public holidays. On other days the admission fee is fifteen cents.

University students are admitted without charge on presentation of their registration cards.

All classes from the schools, art students, and study groups are admitted free.

Additional copies of this bulletin may be obtained, free, from the Department of University Extension, University of Toronto, Toronto 5, Canada.

ROYAL ONTARIO MUSEUM OF ZOOLOGY

BULLETIN No. 4

UNIVERSITY OF TORONTO, SEPTEMBER, 1930



DOWN HOUSE, KENT, ENGLAND,

Where Darwin "thought and worked for forty years, and died, 1882".
It has recently been presented to the nation, and is now open to the public.
Above, view from front; *below*, view from garden.



BOHEMIAN AND CEDAR WAXWINGS

The original from which this is reproduced belongs to the Wallace Havelock Robb collection of paintings of Canadian birds by Allan Brooks. Coloured reproductions of twenty-four of the paintings of this collection are available for distribution as described on page 12.

A NATURAL HISTORY BOOK LIST

Although the advice, "Study nature, not books", is, in general, good advice for the naturalist, some books are necessary to every student who would get the most out of his study of nature, or would contribute the most in the way of discovering new facts and new truths about nature.

One of the first services which books can render to the student is to give him the name by which other students recognize the creatures which interest him, whether they be mammals, birds, reptiles, fish, insects or worms. Descriptive books which enable us to identify animals, therefore, usually form the basis of every naturalist's library.

It is also interesting to know what others have observed about the characteristics and habits of living creatures. Such knowledge, too, is useful to the student intent on discovering new facts for himself. The danger is that most people place too much reliance on the statements found in books, and make too few observations of their own, and that is the reason for the exhortation, "Study nature, not books".

In the following pages are listed some of the best books of the different types indicated above. It is not usually possible to say which is the "best" book in any particular field; not only do opinions differ, but requirements differ; the book which would fill one person's need best might be far from the best one for another's purpose. For this reason an attempt has been made in most cases to indicate briefly the nature of the contents of each book listed.

Because of limitations of space, it has been necessary to limit the titles listed to those likely to prove most generally useful. For the same reason, where volumes have been published in a number of editions, only the cheaper editions have been listed. Rare or out-of-print books have been omitted except in a few instances where it seemed desirable to indicate volumes which students in particular fields might find it advisable to secure through second-hand book dealers.

Although every effort has been made to have the information with respect to the publisher, date and price correct, the information cannot be guaranteed as accurate in every case.

MAMMALS

GENERAL

ANTHONY, H. E. Field book of North American mammals. Putnam (Nature field books), 1928, \$5.00.

Brief descriptive accounts, including life history notes, and distribution, of all North American mammals.

ANTHONY, H. E. (Editor). Mammals of America. (Nature lover's library.) University Soc. Inc., New York.

Describes size, colour, range, food habits, etc., of over five hundred species; profusely illustrated. Sold with "Birds of America" (Nature lover's library) at \$6.25 per volume.

CROSS, E. C. and J. R. DYMOND. The mammals of Ontario. Handbook No. 1, Royal Ontario Museum of Zoology, 1929, 25 cents.

This 52-page handbook lists and briefly describes the mammals of the province, indicating how to distinguish closely related forms. There is also included a list of 82 books and other publications of value in the further study of this group.

INGERSOLL, ERNEST. The life of mammals. Macmillan, 1910, \$2.35.

Mode of life, history and relationship of mammals.

MILLER, G. S. List of North American recent mammals. U.S. National Museum Bulletin 128, Washington, 1924.

A list of all species and subspecies of North American mammals, with citations of original descriptions, type, localities, and general ranges.

NELSON, E. W. Wild animals of North America. Nat. Geogr. Soc., Washington, 1918, \$3.00.

Excellent short accounts of the common wild animals of North America, from bears to mice, with 127 portraits in colour by Louis Agassiz Fuertes.

SETON, E. T. Animals. Doubleday, 1926, \$3.50.

The life histories of some sixty wild animals of the United States and Canada, selected from Seton's "Life histories of northern animals", arranged by R. M. McCurdy, with paragraphs on classification, and other excerpts from Stone and Cram's "American animals"; many coloured plates.

SETON, E. T. Life histories of northern animals. Two vols. Scribner, 1909.

A very valuable work on the mammals of the interior of Canada; particularly valuable for life histories.

SETON, E. T. Lives of game animals. Four vols. Doubleday, 1925-1928.

Very complete accounts of life histories, distribution, etc., of game animals; profusely illustrated.

The Bureau of Biological Survey, U.S. Department of Agriculture has published a series of monographs on mammals under the title, "North American Fauna". Some of the more recent of these are as follows:

No. 48. Voles of the genus *Phenacomys*. A. B. Howell. 1926.

No. 50. Revision of the American lemming mice. A. B. Howell, 1927.

No. 51. A taxonomic review of the American long-tailed shrews. H. H. T. Jackson, 1928.

No. 52. Revision of the American chipmunks. A. H. Howell, 1929.

POPULAR WORKS ON INDIVIDUAL SPECIES OR GROUPS

BRANCH, E. DOUGLAS. The hunting of the buffalo. Appleton, 1929, \$3.00.

The story of the buffalo, how the Indians hunted it, the coming of the white man, the building of the railroads, and the massacre of the buffalo for meat and hides.

HINTON, M. A. C. Rats and mice as enemies of mankind. Economic Series No. 8, 2nd ed., British Museum (Natural History), 1920.

MERRILL, SAMUEL. The moose book. Dutton, 2nd ed., 1920, \$6.00.

NEWSON, WM. H. White-tailed deer. Scribner, 1926, \$3.00.

ROOSEVELT, T., T. S. VAN DYKE, D. G. ELLIOT and A. J. STONE. The deer family. Macmillan, 1903. \$2.00.

Experiences in hunting deer, antelope, wapiti, moose and elk.

WARREN, E. R. The beaver; its work and ways. Williams & Wilkins, 1927, \$3.00.

"The first scientific, comprehensive work on the beaver in fifty years."

WHITNEY, CASPER and others. Musk-ox, bison, sheep and goat. Macmillan, \$2.00.

For additional references, see Cross and Dymond's "Mammals of Ontario".

BIRDS

GENERAL

The most generally useful books to those interested in bird study in Canada are "Birds of Eastern Canada", and "Birds of Western Canada", by P. A. Taverner, of the National Museum of Canada, Ottawa.

In connection with the descriptions of the birds in these books, there are given accounts of the field marks by which the different species may be recognized when seen at a distance, and the characteristics by which each species may be distinguished from the bird which looks most like it. These books are attractively illustrated with coloured plates. They should be ordered from Mr. Wyatt Malcolm, Geological Survey, Department of Mines, Ottawa, Ontario.

Reed's pocket-size "Bird guides" are very useful, especially in the field. Each species is illustrated in colour and there are brief descriptions of the bird, its habits, nesting, etc. These books are as follows,— Land birds east of the Rockies; Water and game birds; Western bird guide; Doubleday, about \$1.25 each.

"Handbook of birds of eastern North America", by F. M. Chapman, (Appleton, 1923, \$4.00), and "Handbook of birds of the Western United States", by F. M. Bailey (Houghton, \$6.00), are indispensable to anyone taking more than the most general interest in birds. Descriptions and general treatment are in greater detail than those given in more popular books. Keys are given for identification, no matter what the sex, season, or age of the specimen may be.

ALLEN, ARTHUR A. The book of bird life. Van Nostrand, 1930, \$3.50.

This "bird book" by the Professor of Ornithology at Cornell University emphasizes the habits and haunts of birds. It deals with such sub-

jects as the home life of birds, courtship, nest building and care of young, and suggests methods of bird study and of attracting and photographing birds.

ALLEN, GLOVER, M. Birds and their attributes. Marshall Jones, 1928, \$3.50.

This excellent book contains chapters on some human relations with birds; feathers; birds' colours and their uses; bills, feet, wings and bones; the food of birds; origin and distribution of birds; some ecological relations of birds; eggs and nests of birds; some parasitic habits of birds; the senses and behaviour of birds; flight and song; birds at rest; bird migration; nomenclature and classification.

CHAPMAN, F. M. Bird life. Appleton, 1924, \$5.00.

An elementary treatment of the biology of birds,—the bird's place in nature and relation to man, structure, colours, migration, voice, nesting; descriptions of the commoner birds of eastern America with 75 coloured plates.

ELIOT, W. A. Birds of the Pacific coast. Putnam, (Nature field books), 1923, \$3.50.

HALES, B. J. Prairie birds. Macmillan, 1927, \$2.50.

Descriptive of the birds of the Canadian prairie provinces, their distribution, breeding habits and migrations.

HOWARD, H. E. Territory in bird life. John Murray, London, 1920.

Deals with the habits of birds during the period of nesting. In the case of many species it is suggested that each pair of nesting birds establishes and maintains a fairly definite domain of its own.

MARSH, E. L. Birds of Peasemars. Musson, 1919, \$1.65.

An account of the birds of a small sanctuary in the Georgian bay region of Ontario, with some account of the need for bird protection and how to attract birds by food, drinking fountains, nesting material, nesting boxes, etc.

MATHEWS, F. SCHUYLER. Field book of wild birds and their music. Putnam, (Nature field books), \$3.50.

NICHOLSON, E. M. How birds live. Williams and Norgate, London, 2nd ed., 1927.

Deals with such subjects as the relationship of birds to other forms of life, struggle for existence, function of birds of prey, mortality, bird communities, song, courtship, etc.

NICHOLSON, E. M. The study of birds. Benn's sixpenny library, No. 66, 15c.

A brief consideration of various phases of ornithology,—how to observe, bird census, bird protection, etc., well worth reading.

PEARSON, T. GILBERT (editor). Birds of America. (Nature lover's library), University Soc. Inc., New York.

Describes a thousand species; three hundred shown in colours; six hundred black-and-white drawings and photographs. Three volumes, \$6.25 per volume.

SAUNDERS, A. A. Bird Song. Handbook 7, New York State Museum, Albany, 75c.

THOMSON, A. L. Birds: an introduction to ornithology. Nelson, (Home university library), \$1.00.

A general account of the characteristics of birds as living creatures, as an introduction to their further study; deals mainly with their habits and behaviour, and to a lesser extent with external characters in their relation to modes of life.

FOR THE ADVANCED STUDENT

ALEXANDER, W. B. Birds of the ocean. Putnam, (Nature field books), 1928, \$3.50.

A handbook for voyagers containing descriptions of all the sea-birds of the world, with notes on their habits and guides to their identification.

BENT, A. C. Life histories of North American birds.

The United States National Museum, Washington, D.C., is publishing a series of bulletins descriptive of the life histories of North American birds. Those issued to date are as follows,—

Bulletin 107, Life histories of North American diving birds.

"	113	"	"	"	"	"	"	gulls and terns.
"	121	"	"	"	"	"	"	petrels and pelicans and their allies.
"	126	"	"	"	"	"	"	wild fowl, part 1.
"	130	"	"	"	"	"	"	wild fowl, part 2.
"	135	"	"	"	"	"	"	marsh birds.
"	142	"	"	"	"	"	"	shore birds, part 1.
"	146	"	"	"	"	"	"	shore birds, part 2.

BROOKS, ALLAN, and H. S. SWARTH. A distributional list of the birds of British Columbia. Pacific Coast Avifauna No. 17, Cooper Ornithological Club, Berkeley, Calif., 1925.

A list of the species reported from British Columbia with literature citations of occurrence.

COUES, ELLIOTT. Key to North American birds. 2 vols., 5th edition, 1903. Out of print.

Essential to the advanced student, "The most generally accepted authority on American birds A final court of appeal of the majority of ornithologists".

EATON, E. H. Birds of New York. 2 vols.

A reprint edition of this fine work was issued in 1923 and is sold in sets only at \$6.00 for the two volumes, postage to Canada \$2.10 extra. Altogether, 411 species are described, and their habits, ecological relations, distribution and economic importance discussed. There is also issued in portfolio form a set of the 106 coloured plates published in the two volumes. These plates are by Louis Agassiz Fuertes. The set is sold at \$1.40 post paid to Canada.

FORBUSH, E. H. Birds of Massachusetts and other New England states. Mass. State Bd. Agric.

The three volumes of this excellent work may be obtained at \$5.00 per volume from the Secretary of the Commonwealth, Room 118, State House, Boston, Mass. This is one of the best general works on the birds of a limited area, in this case of the New England States. It is illustrated by numerous finely reproduced paintings by Louis Agassiz Fuertes and Allan Brooks.

NEWTON, ALFRED. A dictionary of birds. London. Adam and Chas. Black, 1893-1896.

Account of ornithology arranged alphabetically as: Anatomy, bittern, buzzard, cassowary, crane, digestive system, dotterel, eggs, embryology, extermination, eye, falcon, flight, etc.

SAUNDERS, A. A. A distributional list of the birds of Montana. Pacific Coast Avifauna No. 14, Cooper Ornithological Club, Berkeley, Calif., 1921.

Useful to Saskatchewan and Alberta students.

THOMSON, J. ARTHUR. The biology of birds. Macmillan, 1923, \$5.00.

Useful to the general reader interested in natural history, as well as to the special student.

Check-list of North American Birds, prepared by a committee of the American Ornithologists' Union.

The fourth edition of this check-list is to be published in 1930. It contains a list of all North American birds with a brief description of the distribution of the various species.

PROTECTION AND ATTRACTION

HIESEMANN, M. How to attract and protect wild birds. Witherby, London, 1s. 6d.

An account of methods used so successfully on certain estates in Germany.

MINER, JACK. Jack Miner and the birds, and some things I know about nature. Ryerson Press, 1923.

An account of the work of Jack Miner and his sanctuary at Kingsville, Ontario.

The following two very useful pamphlets may be obtained free, on application to the Canadian National Parks Branch, Department of the Interior, Ottawa.

TAVERNER, P. A. Bird houses and their occupants.

Describes types of bird houses suitable for different kinds of birds.

MERRIMAN, R. O. Attracting birds with food and water.

Describes devices for attracting birds about the house, both in summer and in winter.

Excellent accounts of methods of attracting birds and of the principles of bird conservation are included in Forbush's "Useful birds and their protection", and "Game birds, wild fowl and shore birds", listed elsewhere.

ECONOMIC VALUE

"Birds, a national asset", and "Lessons on bird protection", pamphlets distributed free by the Canadian National Parks Branch, Department of the Interior, Ottawa, and "Birds in relation to agriculture", Extension Bulletin No. 52, Manitoba Department of Agriculture, Winnipeg, deal with the value of birds to agriculture. The chapter on Birds in Relation to Agriculture, in Hewitt's "The Conservation of the wild life of Canada" (listed under Conservation), gives an excellent summary of the whole subject.

The United States Department of Agriculture has published many reports on the economic value of birds. A catalogue and price list of such publications may be obtained from the Superintendent of Documents, Government Printing Bureau, Washington, D.C.

FORBUSH, E. H. Useful birds and their protection. Mass. State Bd. Agric.

An account of the value of birds in agriculture and forestry, with methods for attracting them and increasing their numbers.

HENDERSON, JUNIUS. The practical value of birds. Macmillan, 1927, \$3.00.

One of the best books on the economic value of birds.

WEED, C. M., and DEARBORN, NED. Birds in their relations to man. 3rd ed., Lippincott, 1924, \$3.50.

A manual of economic ornithology.

MIGRATION

CHAPMAN, F. M. The travels of birds. Appleton, 1916, 80c.

Birds as travellers, why they travel, dangers by the way, night flyers and day flyers, etc.

THOMSON, A. L. Problems of bird migration. Houghton, 1926, \$5.00.

Gives an authoritative account of the many facts that have been gathered about this subject, and discusses the fascinating problems they present.

WETMORE, ALEXANDER. The migrations of birds. Harvard Univ. Press, 1927, \$2.50.

A summary of present knowledge of migration with the various factors that affect it in its broader aspects.

GAME BIRDS

BEEBE, WILLIAM. Pheasants, their lives and homes. 2 vols., 32 illustrations in colour. Doubleday, 1926. Out of print.

FORBUSH, E. H. Game birds, wild fowl and shore birds. Mass. State Bd. Agric., 1912.

Describes the different species of game birds, wild fowl and shore birds and gives an account of their former abundance and present numbers, and discusses their conservation; refers especially to Massachusetts and adjacent states, but useful for other regions.

JOB, H. K. Propagation of wild water-fowl. Bull. 3, Nat. Assoc. of Audubon Societies, N.Y., 25c.

SANDFORD, L. C. and others. The water-fowl family. Macmillan, \$2.00.

SANDYS, EDWYN. Sporting sketches. Macmillan, 1905.

The author, a native of Chatham, Ont., was a recognized authority on game birds.

SANDYS, EDWYN, and T. S. VAN DYKE. Upland game birds. Macmillan, 1924, \$2.00.

Adventures hunting partridge, grouse, ptarmigan, turkey, plover and crane, are combined with much scientific information.

CAGE BIRDS AND PETS

BUTLER, A. G. Foreign birds for cage and aviary. Pts. I and II, "Feathered World", 9 Arundel St., Strand, London.

CRANDALL, LEE S. Pets and how to care for them. Clark and Fritts, 3rd ed., 1930, \$2.00 plus postage.

Covers the care of pets generally; section 1, dogs, cats, rabbits, etc., section 2, canaries, parrots, pigeons, pheasants, sea-fowl, etc., section 3, the aquarium and aquarium fishes.

WETMORE, ALEXANDER. Canaries, their care and management. Farmers' Bull., 1327, U.S. Dept. of Agric.

Contains a list of books on the care of canaries.

OTHER AIDS TO BIRD STUDY

Excellent coloured reproductions of bird paintings by the Canadian artist, Allan Brooks, are sold by the Royal Ontario Museum of Zoology. These pictures, which are 9 by 11 inches in size, are beautifully reproduced and are suitable for framing for home or school. They are sold in lots of twelve at \$1.00 per set.

First series includes Baltimore oriole, ruby-throated hummingbird, goldfinch, blue jay, loon, ruffed grouse, screech owl, flicker, chickadee and white-breasted nuthatch, belted kingfisher, scarlet tanager, bluebird.

Second series includes horned grebe, herring gull and common tern, great blue heron, mourning dove, osprey, downy woodpecker, nighthawk, kingbird, purple finch, barn swallow and cliff swallow, redstart, house wren and winter wren.

The Museum has also issued a four-page leaflet on Winter Birds. This leaflet describes more than a dozen of the common

winter birds, telling the sort of place in which each kind should be looked for. Identification is made easy by the inclusion of nine pen-and-ink drawings of the birds discussed. Single copies, 5 cents; three copies for 10 cents; in lots of 25 or more, one cent each.

A set of 60 post cards containing coloured reproductions of paintings by Allan Brooks and F. C. Hennessey, is sold for one dollar by the National Museum of Canada, Ottawa.

The National Association of Audubon Societies, 1974 Broadway, New York, sell postcard-size reproductions of bird pictures by Allan Brooks in sets of 50 at \$1.00 per set, as follows,—

Set No. 1. Fifty winter birds of eastern North America.

Set No. 2. Fifty spring birds of eastern North America.

Set No. 3. Fifty summer birds of eastern North America.

The National Association of Audubon Societies also issues "Pocket bird collections", which are 4-page folders, 5×8 inches in size, containing coloured illustrations of common birds drawn to uniform scale. Those of use in Canada are:—

No. 1. Permanent resident and winter visitant land birds of the northeastern states. 63 birds.

No. 3. Early spring migrant land birds of the eastern United States. 74 birds.

No. 4. Common winter land birds of the western United States. 84 birds.

These sets are useful either for classroom study or for field identification. They sell at ten cents per set.

REPTILES AND AMPHIBIANS

BARBOUR, THOMAS. Reptiles and amphibians. Houghton, 1926, \$3.50.

"In this volume I have tried to set forth as simply as possible the various modifications, both in form and in habit, which living reptiles and amphibians have acquired by evolutionary processes to enable them the better to meet varied environmental conditions."

DICKERSON, M. C. The frog book. Doubleday. Out of print.

An account of the structure and habits of the frogs, toads and tree frogs of North America.

DITMARS, R. L. The reptile book. Doubleday. Out of print.

An account of the structure and habits of the snakes, lizards, turtles and crocodiles of North America.

DITMARS, R. L. Reptiles of the world. Macmillan, 1922, \$4.75.

A general account of the structure, classification and habits of reptiles.

RUTHVEN, A. G., C. THOMPSON, and H. T. GAIGE. The herpetology of Michigan. Mich. Handbook Series No. 3, Univ. Museums, Univ. Mich., Ann Arbor, 1928, \$1.50.

Brief accounts of the natural history of all the species of amphibians and reptiles occurring in Michigan, with keys for identification. As most of the species found in Michigan are also found in Ontario, this publication is very useful to Ontario students.

STEJNERGER, L.L., and THOMAS BARBOUR. A check list of North American amphibians and reptiles. 2nd ed., Harvard University Press, 1923, \$3.50.

A list with the nomenclature at present in use and the distribution in brief of all North American species.

WRIGHT, A. H. North American Anura. Pub. 197, The Carnegie Institution of Washington, Washington, D.C., 1914.
Life histories of the frogs, tree frogs and toads of Ithaca, N.Y.

FISHES

BREDER, C. M. Field book of marine fishes of the Atlantic coast. Putnam (Nature field books), \$5.00.

Short descriptive accounts of the fishes found in the waters of the Atlantic from Labrador to Texas, with keys for their identification.

FORBES, S. A., and R. E. RICHARDSON. The fishes of Illinois. State of Illinois, Dept. of Registration and Education, Natural History Survey Division, Urbana, Ill., 2nd ed., 1920.

As the fish fauna of Illinois is quite similar to that of Ontario, this publication, which contains many fine coloured illustrations, will be found very useful in the study of our fishes.

HALKETT, A. Check list of the fish of the Dominion of Canada and Newfoundland, Government Printing Bureau, Ottawa, 1913, out of print.

This list of Canadian fishes contains brief notes on the habitat and distribution of the different species.

JORDAN, D. S. Fishes. Appleton, 1925, \$7.50.

"In this volume the writer has tried to compress all that an educated man is likely to know or care to know about fishes . . . each one of the food and game fishes of the United States is treated with considerable fullness." Contains numerous illustrations, some of them quite good coloured ones of common game species.

JORDAN, D. S., and B. W. EVERMANN. American food and game fishes. Doubleday. Out of print.

"A popular account of all the species found in America north of the equator with keys for ready identification, life histories and methods of capture." Many illustrations, several in colour.

SAGE, DEAN, C. H. TOWNSEND, H. M. SMITH, and W. C. HARRIS. Salmon and trout. Macmillan, \$2.00.

The game fishes of Canada, a 45-page booklet illustrated by 15 coloured plates, published by Canadian Pacific Railway, Montreal, in collaboration with the Royal Ontario Museum of Zoology and Department of Biology, University of Toronto.

Deals with the species of game fish mainly from the angler's point of view.

Guide to the game fishes of Canada. Royal Ontario Museum of Zoology. 10 cents.

A 20-page pamphlet giving brief descriptive accounts of the game fish of Canada with a short statement of methods of conservation.

INSECTS

The most generally useful book to one interested in insects is Lutz's "Field book of insects", listed below. This is not only the best book for beginners in entomology, but will be found invaluable to the advanced student as well.

BROWNE, FRANK BALFOUR. Insects: an introduction to entomology. Bennis sixpenny library, 15c.

BROWNE, FRANK BALFOUR. Insects. Nelson (Home university library), \$1.00.

A general introduction from the biological point of view.

COMSTOCK, J. H. Insect life, an introduction to nature study and a guide for teachers, students and others interested in out-of-door life. Appleton, 1901, \$4.00.

"A brief discussion of insects as a group, followed by a table for separating the different orders and accounts of insects occurring in typical environments, such as pond life, brook life, etc., and excellent directions for the collection, preservation and rearing of specimens."

COMSTOCK, J. H. An introduction to entomology. Comstock Pub. Co., \$6.00.

A general treatise on entomology; includes two parts. Part I, includes chapters on the characteristics of insects and their near relatives, the external and internal anatomy of insects and their transformations. Part II treats of the classification and life histories of insects. It is a revision and expansion of the "Manual for the study of insects."

COMSTOCK, J. H., and A. B. COMSTOCK. Manual for the study of insects. Revised edition, Comstock Pub. Co., \$4.00.

"Designed to meet the needs of teachers in the public schools and students in high schools and colleges. The book is so written that any intelligent teacher can find out for himself the more important facts of insect life. Its most distinctive feature is a series of analytical tables by means of which the family to which any North American insect belongs can be determined."

FABRE, J. HENRI (1823-1915). Souvenirs entomologiques.

The great French entomologist has been described as the "insects' Homer". His books, describing the habits of insects, are written in such a charming literary style that they are among the most popular of natural history works, and have been translated into many languages. "He is, indeed, so pre-eminent in the wealth and precision of his observations, in the ingenuity of his experimentation and in literary expression, that his *souvenirs* will always endure." Darwin referred to him as "a savant who thinks like a philosopher and writes like a poet."

The following of Fabre's books are published by Dodd, Mead and Co., at \$2.00 each,— The life of the spider, The life of the fly, The mason-bees, Bramble-bees, and others, The hunting wasps, The life of the caterpillar, The life of the grasshopper, The sacred beetle, and others, The mason wasps, The glow worm and other beetles, More hunting wasps, The life of the weevil, More beetles. The life of the caterpillar is also published in Macmillan's modern library, and The life of the spider in Hodder and Stoughton's People's library.

FABRE, J. H. Insect adventures. Dodd, \$2.50.

The young people's Fabre; "All manner of fascinating things are introduced to the child reader in a delightfully whimsical manner."

FABRE'S Book of insects. Dodd, \$2.50.

Selected material from Fabre's famous books, illustrated by E. J. Detmold.

FELT, E. P. A popular guide to the study of insects. Handbook 6, New York State Museum, Albany, 1929, 50c.

The title accurately describes this 147-page handbook. It contains lists of references to books and other literature on the various groups of insects.

FOREL, AUGUSTE H. The social world of the ants compared with that of man. 2 vols., Putnam, 1929, \$15.

May remain a classic.

HERRICK, G. W. Manual of injurious insects. Holt, 1925, \$4.50.

HERRICK, G. W. Insects injurious to the household. Macmillan, 1926, \$3.00.

HOLLAND, W. J. The butterfly book. Doubleday, \$5.00.

HOLLAND, W. J. The moth book. Doubleday, out of print.

HOLLAND, W. J. The butterfly guide. Doubleday, cloth \$1.25, imitation leather \$1.50.

A pocket manual for the identification of the commoner species found in the United States and Canada; 295 figures in colour illustrating 255 species.

HOWARD, L. O. The insect book. Doubleday. Out of print.

HUXLEY, J. S. Ants. Benn's sixpenny library, No. 142, 15c.

KELLOGG, V. Insect stories. Appleton, 1923, \$2.00.

"In simple language, tells the story of how they live and what they do. The habits and actions of these tiny lives he writes of in delicate, story-like form, and with a vein of humour which is delightful."

LUTZ, F. E. Field book of insects; with a special reference to those of northeastern United States, aiming to answer common questions. Putnam (Nature field books), 1917, \$3.50.

"A comprehensive, popular account giving directions for collecting and preserving insects and a great many interesting facts respecting our large series of insects grouped in their respective orders, together with keys for the recognition of some of the more characteristic species and the more important groups. It is somewhat systematic in arrangement and contains a large amount of general information. It is an excellent guide or field book illustrated by 24 coloured plates and numerous text figures."

LUTZ, F. E. How to collect and preserve insects. American Museum of Natural History, New York. 10c.

MIALI, L. C. The natural history of aquatic insects. Macmillan, 1922, \$1.50.

An excellent introduction to the study of aquatic insects.

SANDERSON, E. D. Insect pests of farm, garden and orchard. 2nd ed., revised and enlarged by L. M. Peairs. Wiley, 1921, \$4.50.

WHEELER, W. M. Ants, their structure, development and behaviour. Columbia Univ. Press, 1910, \$7.50.

WHEELER, W. M. Social life among the insects. Harcourt, 1923, \$4.00.

An exceedingly interesting, comprehensive, philosophical account of social insects and their habits.

WHEELER, W. M. Foibles of insects and man. Knopf, 1928, \$5.50.

An interesting book making general philosophical comparisons between men and insects.

SPIDERS

COMSTOCK, J. H. The spider book. Doubleday.

FABRE, J. H. The life of the spider. Hodder and Stoughton, People's library.

PATTERSON, A. J. The spinner family. McClurg, \$1.75.

INVERTEBRATES

PRATT, H. S. Manual of the common invertebrates, exclusive of insects. McClurg, 1916, \$5.00.

AQUATIC LIFE

BOULENGER, E. G. The aquarium book. Appleton, 1926, \$3.50.

The author is director of the Aquarium of the Zoological Society of London. The book gives in popular language an account of the life histories and habits of all those inhabitants of ponds, rivers and oceans that have been kept in captivity at the Zoo and elsewhere. It discusses many of the problems that arise in aquarium management.

FURNEAUX, W. Life in ponds and streams. Longmans, 1919, \$2.25.

Although written for the student of fresh-water life in England, will be found useful by anyone interested in the study of aquatic organisms.

MIALL, L. C. The natural history of aquatic insects. See under INSECTS.

MORGAN, A. Field book of ponds and streams. Putnam (Nature field books), 1930, \$3.50.

An excellent introduction to the plants and animals of fresh water and the conditions under which they live.

NEEDHAM, JAS. G., and PAUL R. NEEDHAM. A guide to the study of freshwater biology. American Viewpoint Soc., 1927, \$1.00.

An elementary field handbook for the student of fresh-water biology. Contains keys and pictures by means of which the commoner organisms living in fresh water may be identified.

NEEDHAM, J. G., and J. T. LLOYD. The life of inland waters. American Viewpoint Soc., 1915, \$3.00.

An account of fresh-water life,—its forms, its conditions, its fitnesses, its associations and its economic possibilities.

WARD, H. B., and G. C. WHIPPLE. Fresh-water biology. Wiley, 1918, \$7.00.

A manual for the student of fresh-water organisms; contains keys for the identification of various groups of microscopic plants and animals and also of the larger invertebrate groups such as leeches, crustaceans and molluscs.

THE SEA AND SEASHORE

ARNOLD, A. F. The sea-beach at ebb tide. Century, 1916, \$5.00.

Will help one to identify the marine algae and invertebrates found on the beach of the Atlantic coast. Technical phraseology has been avoided as much as possible.

FLATTELY, F. W., and C. L. WALTON. The biology of the seashore. Macmillan, 1927, \$5.50.

"The main idea underlying the present work is to treat the plants and animals inhabiting the seashore from the ecological standpoint . . . to demonstrate the influence of the environment upon their structure, functions, habits and general reactions." Chiefly British species are treated.

JOHNSON, MYRTLE E., and HARRY J. SNOOKS. Seashore animals of the Pacific coast. Macmillan, \$7.50.

The best popular guide to seashore invertebrates of the west coast.

MINER, R. W. Field book of seashore life. Putnam (Nature field books).

MURRAY, SIR JOHN. The ocean. Nelson (Home university library), \$1.00.

A general account of the science of the sea; methods and results, the depths, temperatures, tides, currents and plant and animal life in the ocean.

RUSSELL, F. S., and C. M. YONGE. The seas. Warne, London, 12/6.

Our knowledge of life in the sea and how it is gained; one of the latest volumes on the subject.

AQUARIA

HODGE, A. E. Vivarium and aquarium keeping for amateurs. Witherby, London, 5s.

A practical guide to the keeping of animals in vivaria and aquaria.

INNES, W. T. Goldfish varieties and tropical aquarium fishes. Innes, Philadelphia, \$4.00.

Deals with the principles of aquarium management and describes the numerous kinds of fishes which may be kept in aquaria.

INNES, W. T. The modern aquarium. Innes, Philadelphia, \$1.00.

An illustrated handbook which explains the principles of aquarium management.

MELLEN, I. M. Fishes in the home. Dodd, 1927, \$2.00.

The author is a member of the staff of the New York Aquarium. Deals with the establishing and maintenance of an indoor aquarium. The first section of the books deals with aquarium plants, water changes, tadpoles, and snails, goldfishes (their breeding, food and care), killyfishes, darters, sunfish, etc. The second section is devoted to a discussion of tropical toy fishes, the salt water aquarium, and the construction of small aquarium and garden pools.

Schoolroom aquaria. Bureau of Publications, Teachers' College, Columbia University, N.Y., 25c.

NATURE STUDY

COMSTOCK, ANNA B. Handbook of nature study. Comstock Pub. Co., 20th ed. \$4.00.

Widely used as a textbook of nature study; "covers the entire field, including birds, insects, animals, large and small, tame and wild, fishes, flowers, plants, trees, and weather, and 'the friendly stars'".

MANUALS

JORDAN, D. S. Manual of the vertebrate animals of the north-eastern United States. World Book Co., Yonkers, N.Y., 13th ed., 1929, \$4.00.

The fact that this manual has gone through thirteen editions during the past fifty years indicates the esteem in which it is held. It contains keys for the identification of all vertebrates found in the area dealt with, including marine forms. It will be found extremely useful by anyone interested in natural history work in eastern Canada.

PRATT, H. S. A manual of the land and fresh-water vertebrate animals of the United States (exclusive of birds). Blakiston, 1923, \$6.00.

As its title indicates, this manual does not deal with birds or marine animals. It covers western America, as well as the east, and like the former, is useful to the Canadian naturalist.

FAULL, J. H. (Editor). The natural history of the Toronto Region, Ontario, Canada. The Canadian Institute, Toronto, 1913, \$2.00.

This valuable work contains short accounts by various writers of the history, geology, climate, life zones, flora and fauna of the Toronto region.

NATURAL HISTORIES

The new natural history, by J. Arthur Thomson. 3 vols., Putnam, 1926, \$6.00 each volume.

"These volumes are outstanding in beauty and charm. Even an illiterate person would look through them with amazement, entranced by the 47 full-page colour plates and more than 1,500 photographs."

The royal natural history, edited by R. Lydekker. 6 vols., Warne, London, 63s.

"Comprehensive in scope, accurate in detail, and fully and truthfully illustrated."

Wild life of the world, by R. Lydekker. 3 vols., Warne, London, 63s.

A descriptive survey of the geographical distribution of animals; illustrated with over 600 engravings from original drawings and 120 studies in colours.

The Cambridge natural history. 10 vols., Macmillan, \$6.25 each volume.

This is not a "popular" natural history illustrated with coloured plates, but a systematic review of the various groups in the animal kingdom arranged in taxonomic order; the standard scientific natural history.

The outline of science, edited by J. Arthur Thomson. 4 vols., Putnam, \$4.50 per volume.

Vol. I contains chapters on the romance of the heavens, the story of evolution, adaptations to environment, the struggle for existence, the ascent of man, evolution going on, the dawn of mind and foundations of the universe; a thoroughly authoritative and at the same time simple statement of the results of research on the various problems discussed.

NEWS NOTES

The trustees of the Royal Ontario Museum have announced that they are about to proceed with the erection of the much-needed addition to the museum building. The new wing will face on Avenue Road and the plans provide for approximately 134,000 square feet of floor space which will more than double the present floor space devoted to exhibition. It will also provide for lecture room and increased laboratory and storage facilities.

The Museum's natural history survey of the province is being continued. During the summer of 1929 the Rainy River district was investigated and found to be an intensely interesting one. An unusually wide variety of birds and mammals was found, including not only those of the northern forest, but also the forms characteristic of cleared farming country. Eastern species were the most numerous, but there appeared to be an increasing percentage of western prairie forms moving in as the country becomes cleared. During the present summer, a party consisting of Messrs. Snyder, Kurata, Logier, Baillie and Stovell has studied the fauna of Prince Edward County, Ontario.

Contribution No. 3 of the Museum, being A Faunal Investigation of King township, York county, Ont., will appear shortly.

Mr. J. H. Fleming, Honorary Curator of Ornithology of this Museum, attended the Seventh International Ornithological Congress in Amsterdam, June 1-7, as a delegate of the American Ornithologists' Union.

The Museum has received as a gift from Mrs. Jonathan Dwight, New York, 160 colour drawings of the soft parts of birds (feet, bills, etc.), by Allan Brooks. Other notable donations recently received include mounted Impala head from Dr. J. W. Inches of Detroit; complete set of "Transactions of Ottawa Field-Naturalists' Club", its successor, the "Ottawa Naturalist", and its successor, the "Canadian Field-Naturalist", (1879-1929) from Wallace Havelock Robb; two passenger pigeons from Mr. Paul Hahn, bringing the number of these specimens which Mr. Hahn has donated to twelve; Major Allan Brooks was instrumental in having donated to the Museum a collection of 145 specimens of California birds from Dr. W. D. Strong, of Lincoln, Neb. Many other valuable specimens have been donated by other friends of the Museum.

ROYAL ONTARIO MUSEUM OF ZOOLOGY

PERSONNEL OF THE BOARD OF TRUSTEES

THE HONOURABLE THE MINISTER OF EDUCATION
THE HONOURABLE THE MINISTER OF MINES
THE CHAIRMAN OF THE BOARD OF GOVERNORS, UNIVERSITY OF TORONTO
SIR ROBERT FALCONER
SIR JOSEPH FLAVELLE, Bart.
COLONEL R. W. LEONARD
MR. J. B. O'BRIAN
MR. SIGMUND SAMUEL
MRS. H. D. WARREN
Chairman of the Board, Mr. J. B. O'BRIAN
Secretary of the Board, Miss HELEN REYNAR
Honorary Trustee, Dr. ROBERT MOND

STAFF

B. A. BENSLEY, B.A., PH.D., F.R.S.C., Director.
E. M. WALKER, B.A., M.B., F.R.S.C., Assistant Director.
J. R. DYMOND, M.A., Secretary.
L. L. SNYDER, Technologist and Associate in Ornithology.
T. B. KURATA, B.S., Preparator.
E. B. S. LOGIER, Artist.
J. L. BAILLIE, Cataloguer.
H. P. STOVELL, Assistant.
J. H. FLEMING, Honorary Curator of Ornithology.
JOHN EDMONDS, Honorary Associate in Ornithology.

Mailing address:

253 Bloor St. West, Toronto.

Telephone:

Kingsdale 1531

ADMISSION

The Museum is open from 10 a.m. to 5 p.m. all week-days except Christmas Day and the morning of New Year's Day. It is also open Sunday from 2 p.m. to 5 p.m.

Admission is free Sunday, Tuesday, Thursday, and Saturday, and on all public holidays. On other days the admission fee is fifteen cents.

University students are admitted without charge on presentation of their registration cards.

All classes from the schools, art students, and study groups, are admitted free.

Additional copies of this bulletin may be obtained, free, from the Department of University Extension, University of Toronto, Toronto 5, Canada.

ROYAL ONTARIO MUSEUM OF ZOOLOGY

BULLETIN No. 5

TORONTO, FEBRUARY, 1935.



THE EASTERN SECTION OF THE NEW EXTENSION OF THE ROYAL ONTARIO MUSEUM OF WHICH THE MUSEUM OF ZOOLOGY OCCUPIES THE WHOLE OF THE THIRD FLOOR.

More than four years have elapsed since Bulletin 4 of the Royal Ontario Museum of Zoology appeared. The first four numbers of this publication were issued by the Department of University Extension, University of Toronto. Although a special fund is not yet available from which the Museum may issue the Bulletin as a regular publication, it is planned to publish an occasional number as funds permit.

The Bulletin is designed as a means of informing the friends of the Royal Ontario Museum of Zoology of its activities and as a medium for the publication of popular articles of interest and value to teachers and their classes and the growing numbers of amateur naturalists who find in natural history a constructive outlet for their leisure.

It is regrettable that there can be no certainty or regularity of publication of news from the Museum or of the popular and scientific papers by the staff but it is hoped that the time will come when some friend will endow the Royal Ontario Museum of Zoology with a publication fund which will solve this problem in some measure.

THE MUSEUM'S COLLECTION OF PASSENGER PIGEONS

A museum, to most people, is an institution where exhibits are displayed to interest and enlighten the visitor. This is indeed an important function of our Museum, but back of this is the fundamental task of bringing together objects and facts and devising methods of preserving these for generations to come. To illustrate this, consider

one special activity of the Museum and of an interested friend and benefactor, Mr. Paul Hahn of Toronto.

The passenger pigeon was once looked upon as a bird whose numbers could never be seriously disturbed. Millions upon millions of these swift, trim pigeons passed from one section of wooded eastern North America to another in the days of the early pioneers. At that time it seemed impossible that they could vanish from the earth entirely—but they became extinct as a wild bird at the close of the nineteenth century! Established museums immediately set about to gather specimens that had been preserved by private individuals. It might have been thought that the salvaging of stuffed birds by an active campaign would soon have exhausted this source of supply so that museums to come later would find it difficult, if not impossible, to obtain specimens. The Royal Ontario Museum of Zoology opened its doors in 1913, many years after the wild pigeon was doomed. To-day, however, it possesses a valuable collection of passenger pigeons. This is due in large part, as already suggested, to the efforts of Mr. Hahn, a naturalist and enthusiastic collector, who has persistently sought out specimens of this extinct species. Old cases of stuffed birds in attic and cellar, city and farm, have been explored and from them many specimens have been rescued from dust and vermin for the Museum, where they are safely stored for posterity. Mr. Hahn will continue his search until locally all such material is properly installed in the collection of this permanent institution. This is a public-spirited work and commendable in every respect. In the matter of saving specimens of a vanished species it is a case of "now or never". Regrettable instances have come to light where good specimens have been destroyed by fire, rats and insects. This is the ultimate fate of all specimens that do not reach the perpetual safekeeping of some museum. The museum's function in our society is to preserve material which constitutes the irreplaceable groundwork of human knowledge, and passenger pigeon specimens definitely belong to this class of material.

THE PASSENGER PIGEON HABITAT GROUP

On January 3rd, 1935, Hon. Dr. L. J. Simpson, Minister of Education, opened the Passenger Pigeon Habitat Group shown in the accompanying photograph. Ontario was within the area frequented by this extinct bird and this group recreates such a scene as must have been commonly witnessed by the pioneer settlers of the province.

WHAT IS A HABITAT GROUP ?

A museum exhibit which depicts an animal amid a representation of its natural surroundings is known as a habitat group. The most satisfying, inclusive and naturalistic type of habitat group includes a panoramic picture as a background. The exhibit thus deals not only with the form and behaviour of the particular animal which is the subject of the habitat group, but it includes numerous facts pertaining to its associations in nature, even to the extent of conveying a general impression of the physiography of a region in which it lives, or has lived, if it be historic. In effect, then, the panoramic habitat group brings to the eye of the museum visitor, within the confines of a museum case, many square miles of nature.

The habitat group tells its own story to all who can see, in much the same way as nature out-of-doors reveals facts to us. The movement of the living animal is absent, of course, but there are compensating advantages such as ease and certainty of observation, elimination of distractions and concentration of incidents. The completeness of the story told by the group is dependent on the powers of observation of him who inspects it.

THE STORY OF THE PASSENGER PIGEON GROUP

The selection of the scene which forms the setting for the passenger pigeon group was made in the valley of the Credit River, Peel County, Ontario. Here, as elsewhere in this latitude of old Ontario, the pigeon flights occurred as the group depicts. Because of the scenic beauty of the Credit valley and because the upper region still retains some semblance of early-day conditions, this site was preferred to several other possible ones. The actual view chosen is a south-by-east aspect from the rising ground on the north side of the river within a triangle marked by the villages of Forks-of-Credit, Caledon and Cataract.

The physiographic features of the distant landscape are reproduced as they are to-day,—the great escarpment in the front, the vague river course at its base and the broad valley on the left. The

foreground is, for the most part, imaginary. A pioneer's clearing is represented, bounded by the stake-and-rider fence of the period and a glimpse of a log cabin is visible over the rolling ground. This part of the scene is as we might have found it in the 1860's.

To assist the observer in fixing the season, a suggestion of recent "sugaring" activities has been introduced in the immediate foreground. By mid-April, however, the sap has almost ceased its spring run but the hand-made cedar pails have not as yet been gathered for storage. Such details as the patches of melting snow from a belated fall which have not yet been completely erased by the increasing warmth of the morning sun help the observer to appreciate the time of day and year.

The visitor inspecting the exhibit should imagine himself standing at the edge of an old beech-maple forest overlooking the pioneer's clearing. The great pigeon flight is under way and will perhaps continue throughout the day. Flocks are breaking away from the main stream to alight in the clearing or enter the woods for feeding. Some drink at the snow pools near the woods, others help themselves to the maple sap still to be found in the pails. Others stop to rest in the trees and on the ground or preen themselves, while still others move forward in straggling bands in search of last autumn's beechnuts concealed beneath the snow-pressed leaves of the woods. A male and female in the foreground touch bills as is the way with pigeons. The male is more resplendently dressed than is the female. His plumage is more colourful and his tail feathers are noticeably longer.

As accessories to the group, several of the early spring flowers characteristic of the hardwood forest have been reproduced in wax. Hepaticas (*Hepatica acutiloba*) with their leaves which have persisted throughout the winter are to be seen here and there in the foreground. A typical plant of this species is conspicuously placed by the maple tree and sap pail in the immediate left foreground. The next most numerous spring flower in the group is the bloodroot (*Sanguinaria canadensis*). A typical cluster of this plant showing the unfolding of its white bloom is found near the front of the case at the right and left. On the left front two plants of the spring beauty (*Claytonia virginica*) are to be found. A profuse growth of the early leaves of the yellow adder's tongue (*Erythronium americanum*) also known as the fawn lily and dog-tooth violet, carpets a part of the foreground. This plant blossoms at a somewhat later date. An occasional scarlet-cup mushroom (*Peziza*) presents its vivid colour through the dry leaves.

Additional accessories include the yellow-bellied sapsucker (*Sphyrapicus varius*), a mid-April migrant, cluster flies and butterflies of species which hibernate as adults and appear in early spring.



THE DISAPPEARANCE OF THE PASSENGER PIGEON

The passenger pigeon is extinct; not a single individual now survives although at the time of the early settlement of Ontario it occurred in numbers greater than those of any species of bird now found here. Men who knew it in the days of its abundance tell us that sometimes the flocks returning from the south in spring were so dense as to "darken the sun".

These birds were an important item of food to the early settlers. Their arrival in spring was welcomed because they supplied a wholesome change in the meat diet of the pioneers. The pigeons were also killed for shipment to cities, in some of the northern states of the United States thousands of men being employed in hunting them for this purpose. In 1869 from the town of Hartford, Michigan, three carloads of pigeons were shipped to market each day for forty days, or a total of 11,880,000 birds. It is recorded that in 1878 in the vicinity of Petoskey, Michigan, "fully fifty teams were engaged in hauling birds to the railroad station. The road was carpeted with feathers, and the wings and feathers from the packing houses were used by the wagonload to fill up the mudholes in the road for miles out of town."

The pigeons were not an unmixed blessing to the pioneer. They fed on his crops, sometimes completely destroying whole fields of freshly-seeded grain in spring or the unharvested crop in summer. Farmers were not sorry, therefore, to see their numbers reduced and we are told that sometimes they drove their hogs into the woods where the pigeons nested and knocked the helpless young from trees so that the animals might feed on them.

The pigeons rapidly grew fewer in the face of such devastating slaughter so that they were never common after 1880. Their decrease was due not only to the killing of such large numbers but to the reduction of the woods in which they nested through the clearing of more and more of the land.

The last wild specimen was collected in 1898. All recent reports are believed to be based on some other species, usually the mourning dove. An unsuccessful attempt was made to perpetuate the species in captivity but the last living passenger pigeon, "Martha", died in the Cincinnati Zoological Gardens in 1914.

CURRENT NATURE NOTES

Profound changes are occurring in the world of animal life in Ontario this year. The phenomenal fluctuation in the numerical status of the snow-shoe rabbit or varying hare (*Lepus americanus*) is now in one of its striking phases. The population of this animal fluctuates between periods of great abundance and great scarcity and at the present time it is declining in numbers in much of Ontario south of the French river after having reached its period of abundance during the summer of 1933. In many areas of northwestern Ontario this hare is still abundant but its decline there is looked for during the coming year.

The situation with reference to the ruffed grouse (*Bonasa umbellus*), which also undergoes marked fluctuations in numbers, is much the same as with the hare. Its numbers have decreased in the southern and eastern sections but it is still plentiful north-westward. It is just ten years since grouse previously became scarce following a period of abundance.

The phenomenon of marked periodic fluctuation in numbers is not confined to varying hares and ruffed grouse, however. The sharp-tailed grouse (often incorrectly called prairie chicken) *Pedioecetes phasianellus*, reached a peak of abundance in different sections of Canada during the past two years. The population (of a northern race of this species) occupying the Hudson and James bay watersheds of northern Ontario and Quebec apparently reached its saturation point in the summer of 1932 and culminated in a pronounced emigration southward during the following autumn and the early winter period of 1932-33. There is no evidence that these emigrants returned to their northern breeding range, all evidence pointing to their near or total disappearance from the more southern territory into which they emigrated. It is reasonable to suppose that the population of this race of the sharp-tailed grouse is now at a low ebb in its northern fastness.

Another far northern bird which it is reasonable to assume attained a peak of numbers recently, after which its population was scattered and probably decimated, is the willow ptarmigan (*Lagopus lagopus*). This ptarmigan normally breeds in the barren tundra region of Canada north of the evergreen forests but regularly winters somewhat south of this range. In the autumn of 1933 and the winter of 1933-34, the species advanced southward in great numbers over a broad front, appearing in areas far removed from its normal range. Such a movement can reasonably be interpreted as culminating a peak of numbers. Data on the final fate of the individuals concerned in such a movement

are very incomplete but undoubtedly their numbers were steadily reduced by various agencies and it is possible that few, if any, of these emigrating birds returned to their northern range. A great reduction of the willow ptarmigan population therefore seems certain.

The general reduction of grouse-like birds in the north and possibly of hares also would be expected to produce a food scarcity for predators which habitually feed upon such animals. These predators would consequently either starve or be forced to move out of the region. It is, therefore, of interest to note that there occurred during the fall of 1934 a flight of goshawks south and eastward into territory where they appear only after rather long intervals. Previous flights occurred during the winters of 1926-27, 1916-17, 1906-07, 1896-97. Some of these flights were very noteworthy, such as those of 1896 and 1906. That of 1916 was not particularly marked. The present incursion of goshawks is perhaps larger than any since 1906. If this incursion is due, as suggested, to the scarcity of grouse, ptarmigan and perhaps hares in their native haunts, the nine or ten year periodicity shown in their southward movements is dependent on a nine or ten-year cycle of abundance and scarcity in these animals.

The present winter is also noteworthy because of the appearance southward of considerable numbers of snowy owls. The normal home of this owl is in the Arctic regions. While it may be seen almost any winter in southern Ontario, it appears in unusually large numbers about every four years. Previous large flights occurred in the winters of 1930-31 and 1926-27. These flights are believed to be caused by the four-year cycle of periodicity in the lemmings of the Arctic region. As the lemmings increase in numbers, the owls also increase with the abundance of food which these small mouse-like animals supply. When the lemmings become scarce, as they do every four years on the average, the snowy owls are forced to move out in search of food and many find their way to southern Ontario and even farther south.

As we gain a deeper insight into the workings of nature, we begin to understand the reasons for occurrences which before appeared inexplicable. The appearance southward of large numbers of northern birds and later of goshawks used to be looked upon as isolated facts of great interest to naturalists but their significance in the ebb and flow of animal life affecting the whole northern half of a continent was not suspected.

ROYAL ONTARIO MUSEUM OF ZOOLOGY

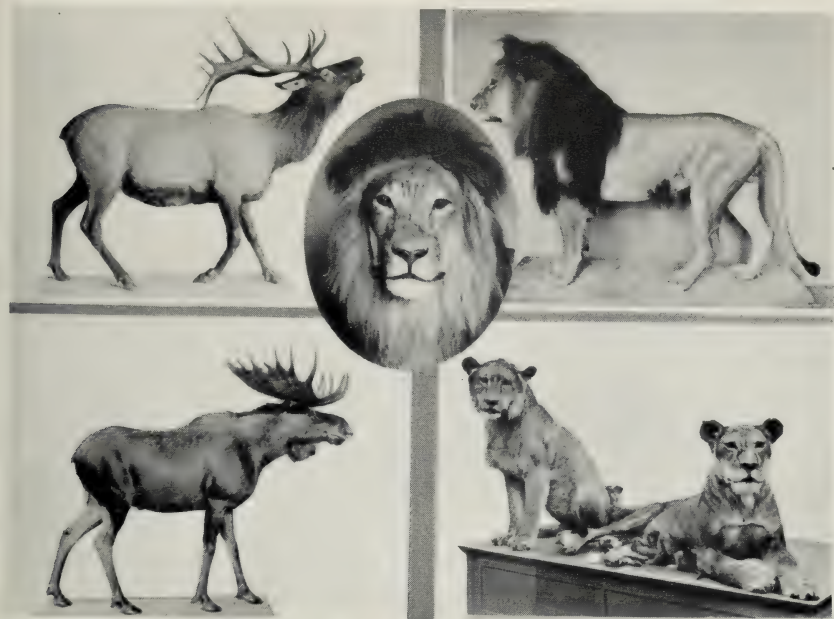
BULLETIN No. 6

TORONTO, JANUARY, 1936.

REUBEN WELLS LEONARD BEQUEST

Through a bequest of the late Reuben Wells Leonard of St. Catharines, the Museum of Zoology has been enabled to add several large mammals to those on exhibition in the galleries.

The preparation of the larger mammals for exhibition, according to modern standards, demands a rather specialized process of prepara-



SOME LARGE MAMMALS MOUNTED UNDER THE REUBEN WELLS LEONARD BEQUEST. WAPITI, ADULT MALE LION, MOOSE AND IMMATURE AND ADULT FEMALE LION.

tion in which sculpture in an applied form is involved. Under the Leonard bequest, Mr. Knud Nielsen, a sculptor-taxidermist, skilled in modern museum methods, has been engaged for this work. A few of the animals recently placed on view are shown in the accompanying illustration. Among the Canadian animals mounted out of this fund are moose, elk (wapiti), bison, polar bear, black bear, cinnamon bear, glacier bear, Kermode's bear and a pair each of Bighorn and White mountain sheep. The exotic species include an adult male, immature male and female lions, tiger, leopard, snow leopard, cheetah, panda and takin.

PANDA AND TAKIN, RARE ANIMALS ADDED TO MUSEUM'S EXHIBITS

The Panda and Takin, recently placed on exhibition in our galleries, are two of the rarest large animals found in museum collections. These specimens were obtained from Dr. Leslie Kilborn, West China University, Chengtu, West China, to whom the Museum is deeply indebted for securing these rare and interesting animals.

The Takin (*Budorcas bedfordi*), an inhabitant of China and Tibet, is a goat-like antelope. It is one of the rarest of animals and is regarded as sacred by the natives, and hence is extremely difficult to secure. It inhabits the thick woods of the mountainous areas, usually being found at about 8,000 feet altitude.

The Giant Panda (*Ailuropus melanoleucus*), is another rare animal of which little is known. Its general appearance is that of a black and white bear but it also has certain affinities with the raccoons and is usually regarded as representing a distinct family, Aeluropidae. It is structurally a carnivorous animal but feeds on the stalks and shoots of bamboo. It is strikingly marked with black and white. The general colour is white but with black ears, black rings around the eyes, black limbs and transverse black bar from shoulders to fore limbs.

ACCESSIONS

Accessions to the museum for the six months' period, May 1 to Oct. 31, 1935, were as follows:—

	Donated	Collected	By exchange	Purchased	Total
Mammals	452	290	10	196	948
Mammal heads					
and horns	21				21
Birds	478	167	7	328	980
Bird nests	25	44			69
Bird eggs	153	110			263
Reptiles	46	3			49
Amphibians	63	35	10		108
Fishes*	240	61		9	310
Molluscs	350	4970			5320
Insects	2098	152			2250
Miscellaneous					
invertebrates	178	419		262	859

* The total number of specimens of fish was far in excess of the number indicated since in the case of small fishes, a lot consisting of representatives of a single species, if taken in the same locality at the same time, is counted as one, even though it may consist of a hundred or more specimens.

THE STARLING IN ONTARIO



WINTER PLUMAGE



SUMMER PLUMAGE

The starling, which is now so abundant in southern Ontario, is not native to North America, but was introduced from Europe in 1890 and 1891. On March 6, 1890, eighty starlings were liberated in Central Park, New York City, and on April 25, 1891, forty more were released at the same place. From these 120 birds originated all of the millions of European starlings now found throughout eastern North America. For six years these starlings and their progeny remained about the point of introduction. Gradually, however, they spread farther and farther from New York and in 1919, twenty-nine years after its liberation in New York, the starling reached Ontario. The first starling was seen in Ontario in July, 1919, five miles west of Brockville. During the following winter (1919-20), it was observed at St. Catharines and in the summer of 1920 at Toronto. Their dissemination over a wide range in Canada has progressed rapidly, so that at the present time they are a numerous and important element of the bird fauna of the southern parts of the Maritime provinces, southern Quebec and southern Ontario. Starlings are now apparently permanently established as far northwest as Port Arthur, Ontario, and birds have been seen as far north as Moosonee and York Factory. Occasional records from Manitoba and a single report from as far west as Alberta seem to presage the general occupation of suitable territory throughout the more southerly portions of the Dominion.

The native home of the common starling (*Sturnus vulgaris*) is the temperate region of Europe and corresponding latitudes in western Siberia. In the old world, the starling is migratory, most of its population travelling south in autumn to the countries bordering the Mediterranean and eastward as far as India. From its native range this species has been successfully introduced into Australia, Tasmania, New Zealand, and South Africa as well as North America.

The starling is a bird of cultivated areas, apparently equally at home about cities, towns or farms. Although it is sometimes seen in wilderness areas, it is never common in such places. Starlings frequently select their nesting territory as early as March and their first nesting occurs, as a rule, in April. Most pairs probably nest twice in the year. The eggs are pale blue and usually four to six in number. The young are cared for in the nest until they are nearly full grown. Young starlings, just out of the nest, wear a rather uniform grey-brown plumage.

Starlings feed on a wide variety of food materials. Both animal and vegetable matter is taken, the proportions varying according to availability which in turn is dependent on the season. In spring and summer, a large proportion of their food consists of insects, both adults and larvae. Cultivated fruits are taken in season, particularly the smaller kinds. In autumn, plant foods bulk large, including rose hips, wild cherries, wild grapes, elderberries and sumac seeds. In winter, they forage about habitations; in cities they resort to garbage dumps, where a great variety of animal and vegetable refuse is consumed.

In late summer, when the last broods of young can look after themselves, family groups congregate into flocks which in turn merge into still larger flocks for roosting. The size of these roosting flocks increases as autumn approaches, finally attaining prodigious proportions, greater than those of any native bird. They are joined, however, by certain native species such as cowbirds, grackles and robins. These large flocks resort for roosting to such widely different situations as small groves in the country, shade trees or wooded plots in cities, or to the ledges and architectural irregularities on the faces of city buildings. These flocks may be seen coming into their roosting places in the early evening. Their settling down for the night is accompanied by considerable shifting about and chattering, which may continue throughout the night. In the early morning, they fly to their outlying feeding grounds. Birds from city roosts travel to country districts, covering many square miles of territory. The fall roosts usually break up in early October. Many of the birds migrate southward to return

in the spring but a plentiful population remains throughout the winter along the southern border of Canada.

The song of the starling is a more or less extended and continuous series of chatters and squeaks, but one usually hears a variety of notes, phrases and songs of other birds interspersed with its native repertoire. Among North American birds whose songs the starling imitates exceedingly well are the bluebird, killdeer, wood pewee and meadowlark, but thirty or more species are imitated more or less successfully.

Whatever attitude we may adopt towards the starling as a new bird in our midst, it is certain that it adds seasonal interest to our environment. During March, before most of our native birds have returned, the starling fills in the bird calendar with its song and other prenuptial activities.

One of the most characteristic attributes of the starling is its wariness. Although it prefers the proximity of man, it avoids complete familiarity with him, suspicion and alertness characterizing its every movement. Even where they are invited to accept food and nesting boxes about dwellings, their circumspect manners are never completely overcome.

The starling is a serious competitor of many of our native birds. This competition does not usually take the form of direct struggle, although occasionally they do dispute with other species for particular nesting sites. Since the starling selects its territory early, several native species which habitually occupy situations identical to those selected by starlings are, in effect, crowded out by this newcomer. Birds which nest in cavities and crevices suffer most severely. Such species include bluebirds, flickers, crested flycatchers, house wrens, tree swallows, martins, nuthatches, chickadees, screech owls, sparrow hawks and downy woodpeckers. The starling is also a competitor of many native birds in the matter of food. The seeds and fruits of many trees and plants are consumed by the fall and winter population of starlings. This food would formerly have served as food for native species.

There is increasing evidence that the starling is becoming a menace in fruit-growing districts. Small fruit crops are attacked, more particularly grapes in September, but also cherries in season. By far the most serious nuisance which has arisen as a result of the increase of this bird to date is the city starling roost. The night congregations of starlings in restricted urban areas, often in mid-summer, offer a problem to civic officials. In such places, the countless hosts of starlings soon create unsanitary conditions. The accumulation of their excreta defoliates trees, kills ground vegetation and results in a very objection-

able stretch over extensive districts. The effect is not only unwholesome but unpleasant in appearance. Buildings where roosts are established are defaced in an unsightly manner. In addition, the noise from these roosts during the evening and often throughout the night is a serious disturbance to residential sections of a city.

CONTROL

It is impossible now to exterminate the starling in North America although some reduction of numbers could undoubtedly be brought about by the continuous use of some efficient large-scale trap during the flocking season. Efforts to reduce the population in particular sections, unless continued year after year, will merely offer opportunities for birds from neighbouring areas to move into territories where competition would be less keen. It is highly improbable that every community in the province could be induced to wage a continuous war on starlings. Any effort short of this will give only partial and temporary relief.

Only time will tell whether starlings will continue to increase in southern Ontario although the number of resident birds must be nearing the maximum that can find a living in that part of the province. Their numbers may also fluctuate to some extent from year to year and it is even possible that they may ultimately come to be less numerous than they are at present. This depends entirely on the action of natural forces destructive to them. The chief forces which tend to keep all kinds of birds and other animals from expanding their numbers are the absence of sufficient food of the particular kind they require and the prevalence of diseases and enemies. It is probable that the starlings introduced from Europe did not bring diseases with them. Whether diseases will develop and spread among them as a result of the crowding effect of their immense numbers remains to be seen. to the starling flocks as a convenient food supply. These bird-eating hawks take the prey which they can catch most easily, and when starlings are more abundant than other birds more of these are eaten than of other species. Of 40 Cooper's hawks killed in 1931 and 1932, 17 had eaten starlings, 8 English sparrows, 4 song birds, 3 grackles, 2 domestic pigeons and 1 game birds. (The crops of some were empty when killed.) On account of the prejudice which exists against all kinds of hawks and owls, it is unlikely that these natural agencies of control will be allowed to exercise their natural influence on starling numbers.—L. L. S.

ERRATA

Page 6: Last Para.—First two lines should read:

The natural enemies of starlings are the bird-eating hawks. In this country, Cooper's hawk and the sharp-shinned hawk are known to turn

Page 8: Second Para.—Second line should read:

Hotel on Monday, Oct. 21. Mr. A. C. Bent, of Taunton, Massachusetts,

SUMMER FIELD WORK

Professor J. R. Dymond spent July and August in Algonquin Park, under the auspices of the Department of Biology, investigating the game fish situation in some of the Park lakes. Much information was secured on the distribution of fish in that area, which presents a very puzzling problem in animal distribution. The problem is probably complicated by the geological history of the area. It is hoped to give further study to this section of the province, both because of its practical and theoretical interest.

Mr. L. L. Snyder, Curator of the Division of Birds, assisted by Messrs. T. M. Shortt and C. E. Hope, visited a number of points in Ontario during the past summer, in an effort to round out our knowledge of the distribution of certain species of birds in central Ontario. By motor the party travelled from Toronto to the south end of Lake Huron, then along the lake shore to the vicinity of Southampton, thence skirting the southern edge of the Laurentian shield by way of Owen Sound, Orillia, Haliburton, thence to Pembroke, Mattawa and return to Toronto. This survey gave information, supported by specimens, on the bird life in important areas of Ontario for which observations had previously been quite inadequate.

Mr. J. L. Baillie visited the National Museum of Canada during the summer for the purpose of securing records of Ontario species included in the National collection of birds.

The past season saw a good deal of activity in the study of small mammals. Mr. E. C. Cross, assisted by L. A. Prince, collected at Glen Major, Bruce County, Penetanguishene and Algonquin Park. Professor A. F. Coventry of the Department of Biology, University of Toronto, in connection with his population studies of small mammals, collected many specimens in Temagami and Algonquin Park. Professor Dymond also collected in Algonquin Park and Mr. Snyder and his party collected some mammals on their bird survey.

Mr. J. G. Oughton attended the Convention of the American Malacological Union at Buffalo at the end of June, and then visited museums in Buffalo, Boston, New York, Pittsburgh and Ann Arbor, looking especially into their methods of handling mollusc collections.

Thirty-two hundred specimens of molluscs were collected for the Museum by Dr. E. M. Walker and Mr. Oughton during the past summer at several points in the Ontario drainage area of Lake St. Clair and Lake Huron.

AMERICAN ORNITHOLOGISTS' UNION MEETS IN THE *MUSEUM

On the invitation of the Trustees of the Royal Ontario Museum, the fifty-third stated meeting of the American Ornithologists' Union was held in Toronto from Oct. 21 to 24, 1935. This was the first meeting of this Society in Toronto and the third in Canada.

The business sessions of the Union were held in the Royal York was elected President succeeding Mr. J. H. Fleming, Honorary Curator of the Division of Birds of the Royal Ontario Museum of Zoology. Mr. Fleming's retirement from the Presidency closed a period of three years' service to the Union in that capacity. Mr. J. L. Baillie of the Division of Birds, Royal Ontario Museum of Zoology, was elected a full Member of the Union.

The reading of papers, which is one of the principal features of the Union's annual meetings, took place on the 22nd, 23rd and 24th. All of these sessions were held in the Royal Ontario Museum. Sixty-seven titles appeared on the programme. Three were presented by members of the Museum's staff as follows:

Ontario and its Avifauna. L. L. Snyder.

The Bird Collection in the Royal Ontario Museum of Zoology. J. L. Baillie.

The Standing of Cory's Least Bittern. J. H. Fleming.

The programme of papers was one of the largest ever submitted to an A. O. U. meeting and covered a wide range of ornithological subjects. It is interesting to note that nearly one quarter of the general papers, those least purely technical, were illustrated by moving pictures.

PUBLICATION OF "THE PASSENGER PIGEON IN ONTARIO"

"The Passenger Pigeon in Ontario", by Margaret H. Mitchell, was published in October, as Contribution No. 7 of the Royal Ontario Museum of Zoology. This publication brings together all that is known about this bird, so far as Ontario is concerned. It has been compiled from statements secured by the Museum from those who knew the pigeon when it was still comparatively abundant and from scattered descriptions and reminiscences in publications of various kinds. The book should appeal not only to naturalists but also to those interested in the early history of the province. It is on sale at the Museum. Price \$1.00 in paper and \$1.50 in cloth.

ROYAL ONTARIO MUSEUM OF ZOOLOGY

BULLETIN No. 7

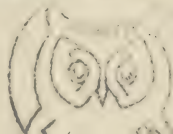
TORONTO, JANUARY, 1938.

AN INTERNATIONAL CHAMPION
BULLDOG "BUNJIE", DONATED
TO THE MUSEUM BY R. P.
SPARKES, ESQ.

*These two specimens were
mounted under the Reuben
Wells Leonard bequest.*



A RARE BREED OF DOG, THE SALUKI, DONATED BY MRS. ADELE MULOCK.
THE SALUKI IS ONE OF THE OLDEST BREEDS OF DOGS KNOWN, IMAGES OF IT
BEING FOUND IN EARLY EGYPTIAN REMAINS.



SOME NEW EXHIBITS

The Breeds of Dogs

A series of mounts of outstanding specimens of various breeds of dogs has been inaugurated. It is not planned to have representatives of all breeds; by selecting widely different types the effect of artificial selection in producing markedly different animals will be strikingly shown.

Two of the first three breeds to be mounted are illustrated herewith. The third, a Canadian champion beagle hound, Vermont Park Leader, was donated by Mr. Emerson Robertson.

Biological Principles

A new series of exhibits is in process of construction. These will deal with a variety of subjects, including biological principles, economics and history. The treatment being used rests on the belief that pleasing colour and composition is especially desirable in presenting these subjects, which might otherwise be unattractive to the average Museum visitor.

The two exhibits that have been completed are somewhat in the nature of three-dimensional posters. The "Role of the Bird of Prey" is the subject of the first. This exhibit is illustrated on the opposite page. Through it, the visitor is presented with the idea that birds of prey (or the whole predatory element of nature, for that matter) have a definite function, by aiding in the control of the numbers of lesser forms on which they feed. Although there are many ramifications of this principle, the exhibit merely presents the idea and illustrates it by two simple instances of local occurrence. A curved background is harmoniously tinted in two tones. A concluding thought, presented particularly for juvenile observers, by a replica of a picture book at the base of the panel, makes the owl and mouse relationship into an allegory of the well-known story of the Pied Piper.

THE REUBEN WELLS LEONARD BEQUEST

Reference was made in Bulletin 6 to the collection of large mammals that had been added to the gallery exhibits as a result of the Reuben Wells Leonard bequest. Additional mounts to be credited to this source are as follows: Buffalo calf, elk fawn, coyote, brush wolf, black timber wolf, white timber wolf, wallaby, Tasmanian devil, mink, two prong-horned antelopes, barren ground caribou, mule deer, mountain caribou, Columbia black-tail deer, saluki hound, English bull dog and beagle hound.



A NEW TYPE OF EXHIBIT, WHICH MAY BE DESCRIBED AS A THREE-DIMENSIONAL POSTER.

MUSEUM AIMS AND FUNCTIONS

The aims and functions of museums have been admirably summarized by a committee of the British Association for the Advancement of Science as follows:

1. Collection of works of Nature and of man. Collecting may be through work in the field, through purchase, and through donations. The first of these is the most valuable as assuring accurate data of provenance. Obviously, the function of collecting must precede all others.

2. Preservation of material thus collected. Much of this is the irreplaceable groundwork of human knowledge, and ought to be safeguarded at all costs. This is the necessary second function.

3. Study of the collected objects. This is the research side of museum work, and, whether carried out by the staff (as in large measure it should and must be) or by specialists under the direction of the staff, it must be prosecuted if museums are to fulfil their highest function, which is the advancement of Science, Art and Industry.

4. Classification of museum material, so that each specimen is readily accessible to future students.

5. Publication of the results achieved and of guides to the contents of the museum.

(a) By printed memoirs, catalogues, summary lists, and guide books.

(b) By the exhibition of specially selected series of specimens in an arrangement designed to bring out some definite information, and provided with labels written for the same end.

(c) By the loan of material to other museums, exhibition galleries, schools and similar institutions.

(d) By lectures in or outside the museum, in the galleries or in a lecture room, on the ordinary exhibited series, or on specimens selected *ad hoc*.

ACCESSIONS

The extent and origin of the additions to the collections of the Museum of Zoology are indicated by the following table of accessions for the year October 1, 1936, to September 30, 1937.

	Donated	Collected	Purchased	Exchanged	Total
Mammals	334	427	255	86	1,102
Birds	698	1,187	482	5	2,372
Birds' eggs (sets)	446	31			477
Birds' nests	92	37			129
Reptiles	95	33			128
Amphibians	96	91		1	188
Fish*	546	645	70	5	1,266
Insects	1,392				1,392
Spiders	71	4,000			4,071
Molluscs*	822	93	1,644	49	2,608
Other invertebrates* .	259	25	44		328

*When a number of small fish, molluscs and other invertebrates are taken in the same place and at the same time, they are usually catalogued and stored together. The total number of specimens in these divisions are therefore much in excess of the number indicated above.

Accessions to the library included 106 books and 2,311 unbound publications.

It is impossible here to mention all the donors from whom specimens have been received. The following are among the more outstanding donations:

AUSTRALIAN MUSEUM (through Miss H. Bain). Collection of 40 species of Australian marine shells.

BOGGS, O. D. Collection of South American birds, all with complete data.

BOWEN, H. M. Skin of cinnamon bear from Rainy River District, Ontario.

BROOKS, Major Allan. 15 skins of Pacific Coast birds.

CHANT, Dr. C. A. 277 mollusc shells from Australia, together with 1 shell saved from the University fire of 1890.

COVENTRY, Professor A. F. 50 mammals, 16 fish, 3 birds' nests, and 2 snakes.

DEEKS, D. B. and T. M. SHORTT. Four thousand feet of motion picture film from Alaskan Expedition.

FERGUSON, R. G. 26 birds from James Bay.

HAHN, Paul. 2 passenger pigeons, making 49 in all donated by him.

HOPE, C. E. 916 insects.

KERR, Charles J. 18 journals of his father and brother, John W. Kerr and Fred Kerr, Fisheries Inspectors of Hamilton, 1864-1898; 39 early reports of the Fisheries Department at Ottawa; 14 other government reports and 5 books.

LUNN, W. H. 45 birds.

MARSH, Rev. Donald B. Skin, skull and antlers of a barren ground caribou, 2 mammals, 10 birds, 11 fish, 119 insects, 9 lots invertebrates.

MORROW, G. A. (through J. R. Barr, Farm Manager). 26 foreign birds from their aviary. Some of these are rare in collections, and difficult to obtain except through such sources.

MCINTYRE, Harold V. Collection of 290 sets of eggs, 63 nests.

NATIONAL PARKS BUREAU, Ottawa. Grizzly bear, trumpeter swan and mountain lion.

PROCTOR, Mrs. Carol. Passenger pigeon.

RONAYNE, J. Columbia black-tail deer.

SAUNDERS, Dr. W. E. 158 birds killed at the Long Point lighthouse.

TONER, G. C. 18 mammals, 44 fish, 4 birds, 29 amphibians and reptiles.

TORONTO PARKS DEPARTMENT. 15 mammals, 23 birds and 9 reptiles, including Parry's wallaby, Grevy's zebra, antelope, Tasmanian devil, fruit bat, peacock, flamingo, brown pelican, and little flamingo.

WHELAN, R. V. A large collection of miscellaneous specimens including molluscs, crustaceans, spiders, fish, birds and mammals.

WHITE, Mrs. David, and family. A valuable collection of scientific publications, the property of Adam White, F.L.S., a member of the staff of the Zoological Department of the British Museum from 1835 to 1863.

WHITE, H. C. 19 mammals, 6 birds, 177 fish.

SUMMER FIELD WORK

The Museum had a most successful summer of field work. Through these field expeditions the Museum is gradually filling up the blanks in our knowledge of the animal life of our province.

An interesting phase of this work is the light it is throwing on the return of life to our province, following the retreat of the last ice sheet. It is evident, for instance, that one avenue by which animal life returned to Ontario was across the St. Lawrence into eastern Ontario. Our work has revealed a number of forms of life that are found in Ontario only in the extreme eastern part of the province. Others are found there and in the south-west but not in the intervening area. For instance, the pilot black snake (*Elaphe obsoleta*) is known to occur in Leeds County in eastern Ontario and in south-western Ontario as far east as St. Catharines, but not in the area between these points. Other species found in eastern Ontario and in the south-western part of the province but not between are the blue-tailed skink, map turtle, musk turtle and Blanding's turtle. Species that have penetrated into eastern Ontario but have not spread westward include the fallfish (*Leucosomus corporalis*) and cutlips (*Exoglossum maxillingua*) and a number of species of spiders discovered by Mr. Kurata of the Museum staff during the past summer. Undoubtedly additional studies in this area will add to this list.

Great interest was attracted by the American Museum of Natural History's expedition to Shiva Temple, an erosion-made "island" in the Grand Canyon of Colorado. The purpose of the expedition was "to study the animal species which, isolated from the mainland for several thousand years, have been untouched by the evolutionary changes going on in the surrounding country." Opportunities of studying similar evolutionary changes are afforded by the animals of eastern Ontario as compared with those of south-western Ontario. Species which occur in these two areas and not between have probably been separated from one another as long as the animals of Shiva's temple have been isolated from the same species on the mainland. In several

respects, Ontario affords an excellent field for the study of problems of zoogeography.

Mammals

Three field work projects were carried out during the summer. Messrs. Cross, Prince and Downing investigated conditions in early spring along the St. Lawrence valley from Kingston to the Ottawa river. An abnormal scarcity of small mammals was found in the area although evidence was available to show that they had been present in some abundance the previous fall.

Messrs. Prince and Downing spent eight weeks in field work along the transcontinental line of the Canadian Pacific Railway between the French River and Chapleau. Collections were made at Chapleau, Biscotasing and Bigwood, completing the survey begun last year of the area between the French River and Rossport on the north shore of Lake Superior.

In addition to this work by members of the staff, collections were made at various points by amateur collectors.

Birds

Prior to 1923, our knowledge of Ontario's bird life was based on casual reports of individual workers, whose field of activity was largely confined to the more populous centres in the south. In 1923, the Royal Ontario Museum of Zoology undertook to carry out a survey of the Province. Except for the necessary adjustment of each summer's work to available funds, this survey has been proceeded with as a systematic programme, although an interruption was enforced during the difficult years of 1931 to 1935.

The objective of such a survey is, first, to determine in some detail the kinds and distribution of birds occupying the provincial area during the reproductive season. Secondly, work in the field provides specimen material for comparative studies which will contribute towards an understanding of racial variation of birds in this part of North America. Other data bearing on the ecology and behaviour of birds and on the physiography and other environmental factors of each district visited, although obtained more or less incidentally, are an important product of these surveys.

The work conducted in the field during the summer of 1937 was directed towards tying together the information obtained in surveys during previous years at key stations—Rainy River, Nipigon, the north-east shore of Lake Superior and Sault Ste. Marie. Mr. L. L. Snyder, Curator of the Division, and T. M. Shortt investigated the region along the Canadian Pacific Railway from the Manitoba boundary to Fort William, establishing four collecting stations along this

line: at Ingolf, Wabigoon, Savanne and Murillo. Mr. J. L. Baillie and C. E. Hope worked along the same railroad through Sudbury District, establishing stations at Chapleau, Biscotasing and Bigwood. Eleven hundred and fifty specimens were collected, all but a very few preserved in the field, ready for incorporation into the Museum's study collection. At least one new species was added to the Provincial list by this summer's work. One hundred and forty-three species of birds were recorded by the combined parties and a provisional estimate of relative abundance arrived at.

Amphibians and Reptiles

No special programme of field work was undertaken by this Division during the past summer. Two short field excursions were made by Mr. Logier, one to Turkey Point and Long Point, Lake Erie, and one to the Meaford district. These field trips were undertaken to secure specimens and information on some species about which comparatively little has been known, so far as Ontario is concerned, viz., the four-toed salamander and the ring-necked snake.

Fishes

On account of the importance of eastern Ontario in the study of animal distribution, special attention was devoted to that area by the Division of Fishes during the past summer. Miss I. Limbert, assisted by Mr. G. C. Toner of Gananoque, made a collecting trip from the St. Lawrence to the Ottawa rivers. At Ottawa, they were met by J. R. Dymond, and ten days were spent in that area. One purpose of this expedition was to secure information in connection with the preparation of an account of the fishes of the Ottawa region, which is to be published for the meeting of the American Association for the Advancement of Science in Ottawa next summer. The expedition was quite successful, all the species expected were found and also some which were a surprise.

Through the co-operation of the Hudson's Bay Company and a number of interested individuals, the Museum is gradually building up a collection of the fishes of the North West Territories. Although this was one of the first parts of the country whose fish life was investigated, there has been comparatively little scientific information added to our knowledge of this area since Richardson published his account of the fishes in the *Fauna Boreali-Americana* in 1836.

Molluscs

Although the Museum has long possessed a considerable collection of molluscs, it is only within the last two or three years that it has been possible to organize the care and study of this material on the basis of a regular division. Although the collection contains a good deal of

material from outside Ontario, special attention is being given to a study of the molluscs of Ontario.

During the past summer, attention was directed to the land shells. Large collections of shells, concentrated by spring floods, were secured by a few days' work at eleven different localities. One such collection has been partially sorted and classified. It yielded over 4,000 specimens, representing more than 40 species. This provides at small expense large series of specimens, suitable for distributional and taxonomic studies, and in addition a surplus for exchange with other museums. Such suites of shells would require perhaps five or six months for collection by ordinary methods.

In addition to collecting designed to build up the collections of Ontario molluscs, a special study of the fauna of small islands was undertaken by Mr. J. G. Oughton. Islands are of interest to the ecologist, since they may be considered as colonies somewhat isolated in space. Such an investigation is expected to contribute materially to the general study of zoological distribution in which the Museum is especially interested.

Spiders

The Museum has an extensive collection of the spiders of Ontario. Much of this collection is a by-product from expeditions sent out for other purposes, but large numbers have been collected by interested friends of the Museum. During the past summer, additions were made from areas hitherto unrepresented: Timagami, New Liskeard, Pembroke and Eastern Ontario.

GROWING SCARCITY OF MOOSE

Concern over the decrease of the moose in Ontario is voiced by correspondents of the Museum. Of 97 giving information on the status of the moose in the province, 49 stated that it was growing scarcer and many expressed concern for its continued existence, unless further protection is given it.

RED SQUIRREL AS A FUR BEARER

During the winter of 1936-37, large numbers of red squirrels were trapped for their fur in many parts of northern Canada.

A MEADOW MOUSE PLAGUE

Early in the autumn, reports of a plague of meadow mice reached the Museum from Kapuskasing and Smoky Falls. According to these reports, meadow mice were excessively abundant over an area at least

eighty miles in length, centering around Kapuskasing. The Museum immediately sent out a questionnaire to correspondents in north-western Ontario in an effort to determine how large an area was affected, and to get as much additional information on the outbreak as possible. From the replies received, it would seem that this outbreak was rather circumscribed. Reports from the Manitoba-Ontario boundary and from the Ontario shore of Hudson Bay indicate abundance in these areas also.

It will be remembered that, during the fall of 1935 and the winter of 1935-36, these mice were very numerous in certain sections of southern Ontario. Reports from New York and Illinois indicate that they were also abundant in 1935 in those states.

UNUSUAL ABUNDANCE OF SPHINX OR "HUMMING BIRD" MOTHS

The Museum has been deluged with requests to identify sphinx moths, which have been unusually abundant in many parts of Ontario during the past summer. These large insects visit flowers for the purpose of feeding on the nectar, much as humming birds do. The sphinx moth which was so numerous in Ontario during the past summer was *Celerio lineata*, a species rarely found even in southern parts of the province. The matter is still under investigation, but it seems likely that these moths came into the province as adults, probably from states immediately to the southwest of Ontario. They appear to have reached every part of the province, including Moose Factory on James Bay.

That the abundance of these moths is of more than local interest and importance is indicated by the fact that, at the recent meeting of the British Association for the Advancement of Science, a paper on cycles of abundance and scarcity of hawk moths was presented. Records extending over 130 years in Britain and 60 years in America were said to demonstrate the existence of such cycles.

DO SNAKES SWALLOW THEIR YOUNG TO PROTECT THEM?

A controversy on this subject arose last year when the following note was published in a number of newspapers across Canada:

"Lecturing on Unnatural History, Prof. J. R. Dymond said that among the stories he would like substantiated are: 'That the mother snake protects its young by swallowing them. . . .'"

The actual statement made during the lecture was: "I do not know for certain whether snakes swallow their young or not. I have never

seen it happen but I believe in the existence of plenty of things I have not witnessed with my own eyes, but I do not believe that the habit of swallowing their young is a regular habit of any of our snakes. If anyone has the kind of evidence to the contrary that would be accepted in a court of law, I am willing to listen to him".

In answer to this challenge, quite a number of persons submitted evidence as to the swallowing of young by old snakes. As the letters to the Museum and in the newspapers accumulated, it became evident that most of the occurrences described happened many years ago. Many of the letters did not state when the events occurred, but twenty-four gave some indication as to time: two said it was 50 or more years ago, four that it was 40 or more years ago, four that it was 30 or more years ago, six that it was "years ago", six that it was "when I was a child", one observer had seen the event in 1935 and one in 1936.

What conclusion can one draw from this evidence? It suggests:

- (1) That snakes once had the habit of swallowing their young that but the practice is dying out.

Or (2) that the passage of time is usually a necessary element in the development of such a mental picture.

What do those who have made a special study of snakes say about this belief? Raymond L. Ditmars, Curator of Reptiles in the New York Zoological Park, in his book, "Snakes of the World", says:

"During thirty years of observation of serpents under all sorts of conditions in which they are found, I have watched them in areas in the temperate zones, on the deserts and in the tropics, and have carried the story (of snakes swallowing their young) in mind. To these observations are added the studies of captive specimens. Thus the author has had every opportunity to verify the occurrence. I have never noted any hint of it. . . .

"Over the period of years I have mentioned, I have never seen a wild serpent or a captive one make any attempt to swallow its young. I have never seen a wild serpent make any attempt of any kind to protect its young—and adults with young nearby have been noted under numerous conditions. . . . It has always been a case of all members of the group seeking individual shelter—and this is the most practical thing to do. . . .

"The adult snake being the most wary is the first to glide to shelter and disappears like a flash under a rock. The young hesitate. They are not so quick in getting a start, but they have instinctive fear of the human. They scatter in all directions. Those near a crevice glide quickly in. Others, taking no chance in losing the split-second's time in turning in a direction other than the head is pointing, glide straight ahead, threading into the longer grass and out of sight. It is a simultaneous disappearance. There is no lost time—no lost motion. Such

a manifestation can be completed so quickly that an experienced collector may not have a chance to capture a single member of the group.

"From what I know about men and snakes, such a reptilian family exodus is thus conducted in the safest way for the snakes. If the mother should indulge in any spectacular action in pausing to hiss, open her mouth and await a parade of snakelets to make their way down her throat, the whole family might be wiped out through the human finding opportunity to seize a stick and kill her, as is the average human way; and the snake is well aware of its danger in the presence of man."

Dr. K. P. Schmidt, assistant curator of Reptiles and Amphibians in the Field Museum of Natural History, Chicago, says, in closing a discussion of the alleged habit of snakes swallowing their young:

"Snake stories of this type are true myths, all the more interesting because they are alive and growing, and herpetologists may resign the study of this field to their anthropological brethren with the hope that it may produce valuable insights into the nature of mythology and folk-lore."

PERIODIC ABUNDANCE AND SCARCITY OF VARYING HARES

Cycles of abundance and scarcity in the numbers of varying hares (snow-shoe rabbits) recur with surprising regularity in the north woods of Canada. It has been popularly believed that the hares die off every seven years, but careful studies have recently shown that the cycles are nearer ten years in length on the average. The years in which hares were last abundant in the Hudson Bay watershed before the successive periods of decrease were as follows: 1856, 1864, 1875, 1886, 1895, 1905, 1914, 1924 and 1934 or 8 cycles in 78 years.

These are some of the conclusions of Dr. D. A. MacLulich, whose four-year study of hare periodicity has recently been published. The study was carried out under the joint auspices of the Department of Biology, University of Toronto, and Royal Ontario Museum of Zoology. This study concerned only the varying hare (*Lepus americanus*) which is also called snow-shoe rabbit. This is the common hare of Ontario from Muskoka northward and of the north woods of Canada generally. It turns white in winter, unlike the cottontail rabbit of southern Ontario and the Ottawa valley and the introduced European hare (wrongly called jack rabbit) which remain the same colour the year round.

Hare populations were found to vary from about one per square mile at times of extreme scarcity to over one thousand on the same area at times of abundance. The highest number met with was in the

north part of Frontenac county in July, 1932, when there were thirty-four hundred per square mile.

Hares do not reach their peak of abundance or begin to die off in the same year in all parts of Ontario. During the recent cycle the last year of great abundance varied as follows:—1932, in a small district centering on the north part of Frontenac county; 1933, from Bruce peninsula and southern Algoma to Renfrew county; 1934, in the height of land country from Temiskaming district past lake Nipigon to include Kenora district; 1935, on the northern part of the clay belt; 1934, on the coast of James bay; and 1933, in the southern part of Patricia region. For Canada as a whole the cycle appeared to reach a peak earliest in the coastal districts of the maritimes and the St. Lawrence valley, the delta of the Mackenzie river, and British Columbia; and latest in the coniferous forest belt across the interior.

Efforts were made to determine the cause of the wholesale dying off which periodically affects the hares. Various parasites were found, including tapeworms, stomach worms, mites, ticks and fleas. Adult tapeworms in the intestine were scarce, but young stages which look like small bladders with a white spot in each, were found in 40 per cent of the hares examined. From the condition of the infested animals, however, it appears that these do no great harm. Large watery cysts containing many white granules which are the heads of another species of tapeworm, *Multiceps serialis*, occurred rarely. These cysts or bladders grow between the muscles and can interfere with the use of limbs or other organs. These worms grow to adult form in the intestines of dogs, wolves, foxes or other animals so unfortunate as to eat infected rabbits.

Numbers of the blood-sucking stomach worms, *Obeliscoides cuniculi*, were found in the stomachs of nearly all the hares examined. At Smoky Falls on the Mattagami River in the summer of 1935 stomach worms caused an epidemic, the only one observed during the present study. In spite of proper care, numbers of recently captured hares died in convulsions and no other possible cause of death could be found.

Rabbit ticks were by far the most numerous of the external parasites. They were found in all hares in summer, sometimes in numbers as high as three thousand ticks per hare.

There was no evidence that any bacterial disease was responsible for the recent decrease in hare numbers. A disease known as tularemia or rabbit fever, which is known to infect human beings, was found among hares in widely separated parts of Ontario but not in any large percentage of the population.

The periodic decrease in hare population is due to a wholesale dying off, but the epidemic that causes it is not always the same disease at every time and place. The course of a cycle is as follows:—The

hares increase according to their natural powers of reproduction until they approach a condition of abundance when their increase slows down and their numbers tend to remain at this more or less high level of population. This density of population never endures for long, however, as crowding and the conditions of the animals' sanitation and feeding inevitably favour the spread of some disease or parasite. For instance, when a thousand or more hares live on a square mile the chance of spreading stomach worms is much greater than when only one or two occur on the same area. The eggs of these worms are voided by the hares with their droppings, the tiny larvae which hatch from these eggs adhere to plants and infect hares which eat them. The denser the population, the greater the chance for infection with parasites or disease. It is under crowded conditions that one disease or another makes its appearance in epidemic form.

No support was found for the belief that hare cycles are caused by cycles in the numbers of sun spots. Statistics of sun spot numbers and hare populations for the past seventy-five years show that sometimes the maximum numbers of sun spots occur when hares are at their peak of numbers and at other times when their populations are at the lowest point. Between 1856 and 1933 there have been eight hare cycles but only seven sun spot cycles.

MUSEUM PUBLICATIONS

Following is a list of publications in various series issued by the Museum. These publications, except for the Bulletins, cannot be supplied free except to institutions with which exchange arrangements have been made. To others the price has been made as low as possible, in order to permit anyone interested to obtain copies. The Museum has no special publication fund and depends for the issuing of additional publications, in part at least, on receipts from the sales of those previously issued. The low price at which many of these are sold is made possible by the fact that they were originally published elsewhere, for example, in the Transactions of the Royal Canadian Institute, the University of Toronto Studies and the Report of Commissioner of Fisheries of British Columbia. The publication of Contributions 7 and 10 were made possible by a grant from the Reuben Wells Leonard bequest and Contribution 2 by a donation of Wm. Robertson, Esq.

CONTRIBUTIONS

This series contains reports of Museum studies, including faunal surveys. Except where otherwise stated the price is twenty-five cents a copy.

1. A Faunal Survey of the Lake Nipigon Region, Ontario. By J. R. Dymond, L. L. Snyder and E. B. S. Logier. 58 pages.

2. A Faunal Survey of the Lake Abitibi Region, Ontario. By the staff of the Royal Ontario Museum of Zoology. 46 pages.
3. A Faunal Investigation of King Township, York County, Ontario. By L. L. Snyder and E. B. S. Logier. 42 pages (out of print).
4. A Faunal Investigation of Long Point and Vicinity, Norfolk County, Ontario. By L. L. Snyder and E. B. S. Logier. 120 pages (out of print).
5. Some Account of the Amphibians and Reptiles of British Columbia, by E. B. S. Logier. 26 pages. (out of print).
6. A Study of the Sharp-tailed Grouse, by L. L. Snyder. 66 pages.
7. The Passenger Pigeon in Ontario, by Margaret H. Mitchell. Records of the history of the now extinct wild pigeon (*Ectopistes migratorius*) in Ontario. Paper, \$1.00. Cloth, \$1.50.
8. The Distribution of Breeding Birds in Ontario, by James L. Baillie, Jr., and Paul Harrington. 134 pages.
9. Some Freshwater Fishes of British Columbia, by J. R. Dymond. 14 pages.
10. The Birds of the Lake St. Martin Region, Manitoba, by T. M. Shortt and Sam Waller. 51 pages.
11. Baird's Sparrow, by B. W. Cartwright, T. M. Shortt and R. D. Harris. 44 pages.

OCCASIONAL PAPERS

These are brief reports of scientific work not extensive enough for inclusion in the Contribution series. Price, 10 cents a copy.

1. A New Genus and Species of Flightless Duck from Campbell Island, by J. H. Fleming.
2. A Revision of the Sharp-tailed Grouse with a Description of a New Race, by L. L. Snyder.
3. A Summary of Data Relative to a Recent Invasion of Willow Ptarmigan, by L. L. Snyder and T. M. Shortt.

HANDBOOKS

As the name suggests, this series includes brief, popular accounts of the subjects dealt with. They are intended as guides to the study of the groups discussed. Each includes a number of illustrations.

(Unnumbered) Guide to the Game Fishes of Canada. (Out of print).

- No. 1. The Mammals of Ontario, by E. C. Cross and J. R. Dymond. 25c
52 pages; lists and briefly describes the mammals of the Province, indicating how to distinguish closely related forms; includes a list of 82 books and other publications of value in the further study of this group.
- No. 2. The Hawks and Owls of Ontario, by L. L. Snyder. 35c
48 pages; describes the hawks and owls occurring in Ontario, stressing the characters by which each may be identified when seen at a distance; illustrated by 30 pen and ink drawings. An important feature is the discussion of the food habits of the different species, based on the examination of several hundred stomachs of birds killed in Ontario. The biological role and place of the birds of prey in nature are discussed at length in the introduction.
- No. 3. The Amphibians of Ontario, by E. B. S. Logier. 25c
16 pages; describes the 20 species of frogs, toads and salamanders of Ontario, indicating how they may be distinguished; illustrated by 20 pen and ink drawings.

LEAFLETS

The leaflets, with the exception of No. 2, are 4 pages. They are intended for use in schools but will be found of interest to anyone desiring a brief, popular account of the subject discussed. Single copies are sold at 5 cents or three for 10 cents; in lots of 25 or more they are 1 cent each.

1. Winter Birds. (out of print).
2. Twelve Canadian Birds. To accompany the second series of reproductions of bird paintings by Allan Brooks.
3. The Passenger Pigeon Habitat Group. (Out of print).
4. The Starling in Ontario.
5. Teaching Conservation.
6. The Eastern Speckled Trout.
7. Wild Life Conservation.
8. The Humane Treatment of Animals.
9. About Birds in Winter.
10. Bats.
11. Beginning Bird Study.

BULLETINS

The Bulletins contain reports of Museum work, accessions, gallery exhibits, surveys, studies and publications. They are distributed free only to Museum correspondents who regularly supply the Museum with information on wild life conditions in their areas. The price to others is 10 cents per copy. The present is Number 7 in this series.

BIRD PICTURES

Two sets of bird pictures have been distributed by the Museum but only the second set is now available—twelve coloured reproductions of bird paintings by the Canadian artist, Allan Brooks. These pictures, which are 9 by 11 inches in size, are beautifully reproduced and are suitable for framing for school or home. The birds represented are horned grebe, herring gull and common tern, great blue heron, mourning dove, osprey, downy woodpecker, nighthawk, king-bird, purple finch, barn swallow, redstart, house wren and winter wren. Price, 50 cents.

FIELD-CHECKING LISTS (5c a single copy, 3 for 10c, 1c each in lots of 25 or more).

BIRDS

A 4-page folder 3½ by 6 inches, containing a list of 305 birds that have been identified in the Toronto region; useful almost anywhere in Ontario for recording observations.

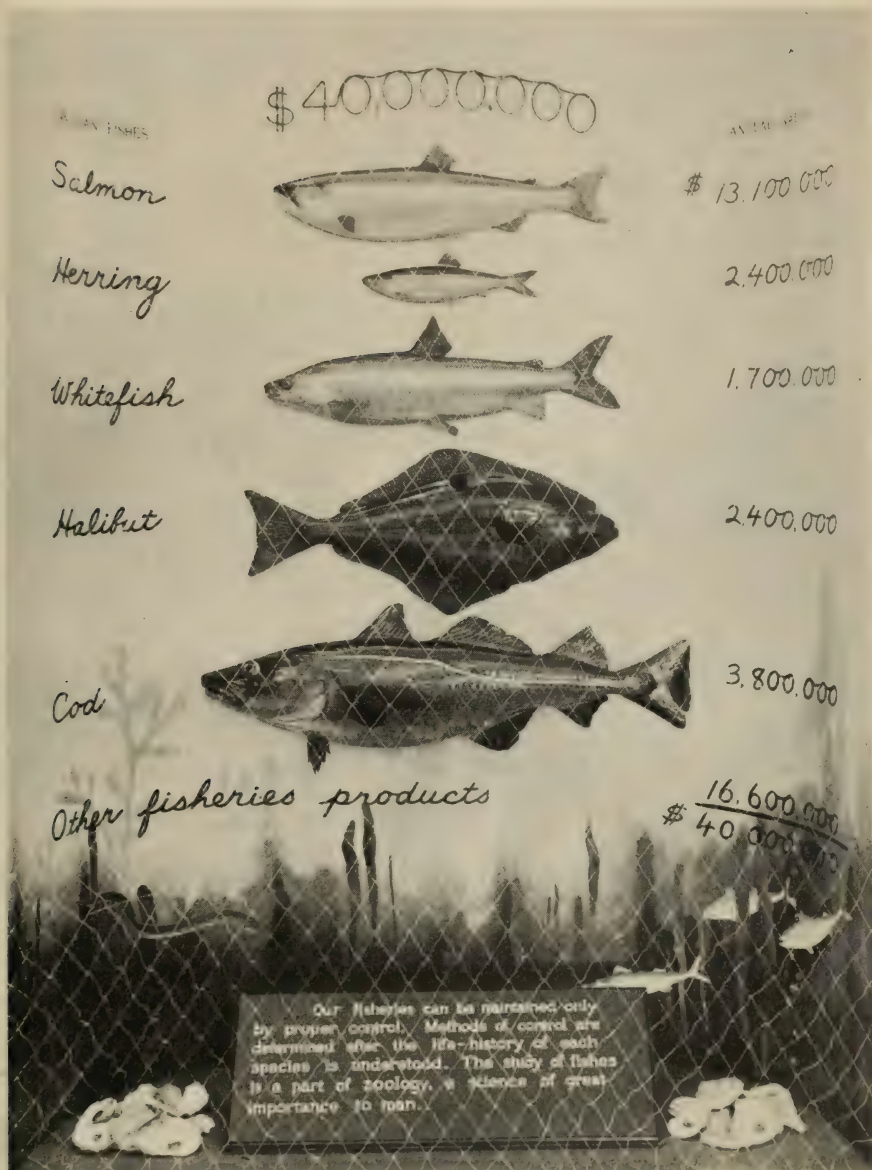
MAMMALS

Similar to above, listing 44 species of Ontario mammals; specially useful for recording trapping results.

ROYAL ONTARIO MUSEUM OF ZOOLOGY

BULLETIN No. 8

TORONTO, NOVEMBER, 1938.



A RECENTLY INSTALLED EXHIBIT, ILLUSTRATING SOME OF THE MORE IMPORTANT COMMERCIAL FISHES OF CANADA

ACCESSIONS

Additions to the museum collections result chiefly from the work of museum field parties and from donations. Material necessary in connection with the study of certain problems which cannot be obtained by collection or by donation must be obtained through purchase or exchange. The extent of the materials obtained by these means during the period October 1, 1937, to September 30, 1938, is indicated in the following table:

	<i>Donated</i>	<i>Collected</i>	<i>Purchased</i>	<i>Exchanged</i>	<i>Total</i>
Mammals.....	500	1,140	164	72	1,876
Birds.....	1,453	842	612	62	2,969
Birds' eggs (sets).....	58	36	0	30	124
Birds' nests.....	16	31	0	0	47
Amphibians.....	120	101	0	0	221
Reptiles.....	51	34	0	0	85
Fish*.....	706	461	17	0	1,184
Insects.....	9,082	8,110	0	0	17,192
Spiders.....	32	13,160	0	0	13,192
Molluscs and other invertebrates*.....	1,621	605	1,100	16	3,342

*In the case of fish and molluscs, the numbers given indicate the number of lots.

Accessions to the library included 207 books and 4,443 pamphlets.

Some of the outstanding donations were as follows:

BOGGS, O. D. 289 bird skins and 4 sets of eggs from Peru and Ecuador. This makes a total of 445 bird skins from these countries which Mr. Boggs has donated to the Museum in the years 1936, 1937 and 1938.

BRODIE, J. A. Nest of mockingbird. The first record of breeding in the Toronto region.

BROOMAN, R. C. 70 small mammals from the Waterloo vicinity.

CHARLTON, C. L. Magpie. This is probably the first Ontario specimen to be preserved.

COOK, Marshall A. Mounted sailfish.

COVENTRY, Prof. A. F. 54 small mammals and 1 bird's nest.

DADISMAN, A. J. 59 bats.

DEAR, Col. L. S. Set of Holboell's grebe eggs and set of Bonaparte's gull eggs.

This is the first set of Bonaparte's gull eggs reported from Ontario.

DEVITT, O. E. Nest and eggs of yellow rail, the first taken in Canada.

DOAN, K. H. 359 lots of small fish collected in the Toronto region, 17 bats, 1 snake.

FERGUSON, R. G. 19 birds from Moosonee, Ontario.

FOSTER, C. F. Cast of great auk's egg.

HAHN, Paul. Passenger pigeon, the 50th donated by Mr. Hahn.

HERRINGTON, Rev. H. B. Large collections of flood debris containing great numbers of shells from Hastings County, a district hitherto unrepresented in our collection.

- HOPE, C. E. 192 skins of birds, mostly from Credit Forks, Ontario.
- KILBORN, Dr. L. G. 2 lesser pandas, also collection of land and freshwater shells from Chengtu, Szechan, China; our first land and freshwater shells from China.
- LEARMOUTH, H. 38 bird skins representing 25 species from Somerset Island, North West Territories. This is our most northerly collection.
- LUNN, W. H. 30 birds, 1 nest and 2 sets of eggs from Prince Edward County, Ontario.
- MACGILLIVRAY, G. A. Diary of Charles Fothergill.
- MACMILLAN, D. E. Ivory gull, probably the second to be preserved from Ontario.
- McILWRAITH, Estate of the late Thos. 12 mounted birds from the collection of the late Thomas McIlwraith, author of "The Birds of Ontario". This lot included a passenger pigeon, Mississippi kite and Eskimo curlew (the latter two new to the collection) and several others of especial interest.
- NELSON, G. W. 2 fork-tailed petrels, new to our collection.
- OSBURN, Prof. R. C. 8 species of fish from Ohio, not previously represented in our collection.
- PERKINS, Sid. Champion airedale.
- QUENTIN, Rev. A. P. and Peter. 130 skins of birds from West China.
- RUTTER, R. J. 187 bird skins, 4 nests and 78 small mammals.
- SHORT, T. M. 187 skins of Manitoba birds.
- SOUTHAM, H. H. 12 birds and 2 eggs from Pilgrim's Island, P.Q.
- STEGGALL, Miss Winnifred M. Champion pug.
- URQUHART, F. A. 1,340 miscellaneous insects.
- WALLER, Sam. 61 birds, 3 nests, 22 sets of eggs, 10 mammals and box of shells.
- WHELAN, R. V. 35 small mammals from Smoky Falls, 1 set of eggs, and 1 starling (the first to be taken from Smoky Falls).

FIELD WORK

One of the duties of the Royal Ontario Museum of Zoology is to make available information on the natural history of Ontario. While the general features of the animal life of the province are known, there are many blanks in our knowledge of the details of distribution. It is to round out this knowledge that parties from the museum carry on field work in various parts of the province each summer. During the past summer, work was carried on in the following areas:

Favourable lake region, Patricia District, Ontario. This is the first field expedition made by the museum to the vast area north of the transcontinental line of the Canadian National Railways. The expedition this summer was made possible by a grant from the Reuben Wells Leonard bequest. C. E. Hope, L. A. Prince and G. M. Neal spent ten weeks at the Berens River Mines Ltd., and made extensive collections of the mammals, birds, reptiles, amphibians, fish, insects, spiders, molluscs and other animal life of the region.

Lake Edward, Quebec. To understand certain features of the mammal life of Ontario, it is necessary to study specimens from farther east in Canada. In 1895 Outram Bangs and E. A. Bangs collected at Lake Edward, Quebec Co., P.Q., and described a number

of new forms, whose status is still in doubt. During the past summer, E. C. Cross and Stuart Downing, with Beverley Scott as assistant, spent two months at Lake Edward and neighbouring regions in Western Quebec, in order to secure material to throw further light on the characteristics of the mammals described for the area.

Timagami. J. G. Oughton continued his studies of the factors influencing the distribution of animal life in the Timagami area. This area is especially interesting for a study of this kind since it includes islands of widely different sizes and of quite different physical conditions.

Point Pelee, Ontario. This is the most southerly region of Canada and is therefore of special interest, since it contains animal life not found elsewhere in this country. F. A. Urquhart and T. B. Kurata spent some weeks in this area, their studies concerning especially the insects and spiders of the region.

Manitoulin Island. J. L. Baillie visited Manitoulin Island during June in an attempt to add to our knowledge of the bird life of this interesting region.

The Canadian Arctic. Through the invitation of the Administration of the Northwest Territories, T. M. Shortt was enabled to visit the eastern Arctic on the Canadian Government Patrol steamer "Nascopie". He secured 172 specimens of birds as well as bringing back many coloured and pencil sketches of birds.

MUSEUM EXHIBITION

Four of the new type exhibits mentioned in the last Bulletin have been completed. One of these, dealing with the Role of the Bird of Prey, was illustrated in Bulletin 7. Two others are illustrated in the present number of the Bulletin. The fourth one, entitled Nature's House that Jack Built, illustrates the biological principle of the food chain and the pyramid of numbers by means of specimens illustrating "This is the hawk (red-shouldered hawk) that eats the snake (two garter snakes) that eats the frog (four leopard frogs) that eats the hopper (sixteen grasshoppers) that eats the grass (thirty-two grass plants) that grows in the earth about us.

A specimen of Kerry Blue Terrier has been added to the collection of record dogs.

Other additions to the gallery exhibits include grizzly bear, grey timber wolf, mountain lion, kinkajou, marmoset monkey, Stone's mountain (black) sheep, and albino porcupine.

Two cases to be used in connection with the Museum's travelling exhibits were prepared as follows: Fine feathers make fine birds (seven brilliantly coloured birds), Birds of the night (seven Ontario owls).

A series of large-scale models of insects and other small animals is in process of construction. Those completed to date are the grasshopper (ten times natural size), woodlouse (twenty-five times natural size) and spider (fifty times natural size). Such models enable the average museum visitor, unaccustomed to examining such tiny creatures, to understand something of their structure.

The exhibits of living animals continuously on view is an attractive feature of the gallery. Living animals are always more interesting than ordinary museum specimens, but naturally there is a limit to the number of live specimens that can be included in a museum. The exhibits are changed from time to time so that in the course of a year, a wide variety of fishes, both native and tropical, frogs, salamanders, snakes, turtles, lizards, molluscs, crayfish, etc. are shown.

Temporary exhibits are placed in the gallery from time to time. Those arranged during the past year include an exhibit of nature photographs by local naturalists, an annual exhibit of tropical fish by the Toronto Aquarium Society, a display of tropical moths and butterflies, a group of animal drawings made in the gallery by students of the Western Technical School, an exhibit of nature projects by children, a display of Australian shells and specimens secured by the Museum's various summer expeditions.

WORK OF THE MUSEUM DIVISIONS

Mammals. Two chief projects are being carried on in the division of mammals. One is a study of the distribution and taxonomy of the mammals of Ontario: the other is the compilation of records of the changes in the numbers of mammals. Distributional and taxonomic studies involve the collection and comparison of series of skins from different parts of the country. In connection with this work 1,876 specimens were added to the collection during the past year. In addition to caring for these specimens, an effort is being made to overtake the arrears of cataloguing which had accumulated before the organization of the mammal work as a separate division.

Some account of the importance of population studies is included elsewhere in this bulletin. The accumulation of this information involves the distribution of questionnaires to hundreds of correspondents in Ontario and in other parts of Canada. Many of the records contained in these questionnaires are not immediately compiled; they are filed for future use in population studies of various kinds. A special inquiry into the deer population and the kill in different parts of the province has been undertaken and the results published in an article by Mr. Cross published in *Rod and Gun* under the title "The White-tailed Deer Crash".

Birds. The work of the bird division includes the collection, preparation, cataloguing and care of study specimens, mapping the distribution of birds in Ontario, taxonomic studies on special groups of Canadian birds and various types of educational work. The report of museum accessions indicates that nearly three thousand specimens of birds were added to the collection during the year.

Studies completed and reported on are indicated in the list of publications elsewhere in this bulletin. Studies of a similar nature are in progress. The division has also advised on the compilation of and undertaken the circulation of a questionnaire on the pileated woodpecker, for a study being made by R. D. Ussher and O. E. Devitt. This is the sort of co-operative study which we wish to promote with workers outside the staff. There are many problems of a similar nature which could be undertaken in the same way, by qualified workers under the supervision of the division.

A statistical study of birds, based on one of the museum files which contains more than 10,000 daily lists of birds seen in the Toronto region during the past fifty years, is being made by J. Murray Speirs. When completed, this work will give for all species of birds visiting the Toronto region the earliest date of arrival, the "peak" dates of spring and autumn migration and much other information of interest in connection with the ornithology of the Toronto region. These studies have also brought to light periodic fluctuations from year to year in the numbers of certain birds, which were not previously suspected.

A further aid to ornithological research has been rendered by the loan of specimens to workers in other institutions. Loans have been made to the following institutions during the year: Bureau of Biological Survey, Washington; National Museum of Canada, Ottawa; University of California.

Reptiles and Amphibians. There is great popular interest in reptiles, particularly snakes. This is reflected in the questions and requests for information that come to the Museum. This service is a legitimate function of the Museum but it sometimes interferes seriously with other Museum projects.

Requests for loan of specimens by scientific workers were fulfilled as follows: 248 toads were loaned to Graham Netting, Carnegie Museum; 22 fox-snakes were loaned to Roger Conant, Philadelphia Zoological Society; 40 British Columbia garter snakes were loaned to Professor J. R. Slater, College of Puget Sound.

A study of the status of *Rana cantabrigensis*, a northern wood frog, has been continued. This has involved the examination of 353 specimens loaned by the Museum of Zoology, University of Michigan.

A notable discovery by this division during the past year was the finding by E. B. S. Logier and W. J. LeRay of Butler's garter snake (*Thamnophis butleri*) in Ontario. This species, not previously known from Ontario, was found by Messrs. Logier and LeRay near Newbury, Middlesex County. Its range in the United States includes extreme western New York, western Pennsylvania, Ohio, Indiana, Michigan and a small area in southwestern Wisconsin. It is suspected that this is another example of a prairie species spreading into Ontario as our province becomes more prairie-like with the clearing of its forest cover. The red-barred garter snake (*Thamnophis sirtalis parietalis*), a western subspecies of our common garter snake, was discovered by the field party to the Favourable lake area of Patricia District. This is the first record of its occurrence in Ontario.

Fishes. One of the projects receiving special attention in the division of fishes is mapping the distribution of the different species of fish found in Ontario. This distribution is moderately well known for southern and central Ontario. During the past two years, special attention has been given to eastern Ontario. G. C. Toner of Gananoque again collected in that area. The fish life of Algonquin Park is being made known through the work of the Fisheries Research Laboratory of the Department of Biology, University of Toronto. The limits of the distribution of species northward and westward is one of the important problems remaining. In the case of game species such as speckled trout and maskinonge, information is occasionally secured from sportsmen, mining men and others who live or travel in that part of the province, but for the smaller forms collecting by museum parties is a necessity. The expedition to the Favourable lake area, Patricia District, contributed important information in this connection.

Our collection of the fishes of northern Canada has been increased through the receipt of specimens from Aklavik at the mouth of the Mackenzie river, from Eskimo Point on Hudson Bay and from other sources in the Arctic. The museum's collection is especially rich in coregonine and salmonoid fishes from northern Canada.

Insects and Spiders. The accession report indicates that 17,192 insect specimens were added to the collection during the year. These were distributed among the orders as follows: Orthoptera 7,135, Lepidoptera 1,319, Hymenoptera 923, Coleoptera 313, Diptera 122, Odonata 22, Trichoptera 15, Ephemeridae 11, Miscellaneous 7,332.

The insect collection has also been enriched by a number of additional paratypes and topotypes which have been obtained through

the medium of exchange. These include two topotypes and thirteen paratypes of Diptera received from Mr. D. Elmo Hardy of Brigham Young University, to whom the Division had loaned a collection of Bibionidae in connection with his researches; two paratypes of Saltatorial Orthoptera from the United States National Museum in exchange for two paratypes of *Nemobius*; two paratypes of Blattariae from the Academy of Natural Sciences, Philadelphia, in exchange for material sent to Mr. M. Hebard. The addition of such material to our collection is of great value, especially in view of further research on species indigenous to the province of Ontario.

In addition to answering questions concerning the identification of insects and the control of insect pests, submitted by visitors calling at the museum or by mail and telephone, the division of entomology has made contacts with the public through the medium of lectures.

The research carried on during the past year by the division concern chiefly Orthoptera. Attention is still being devoted to records of occurrence of *Celerio lineata* in Ontario. An account of an unusual immigration of this species was given in the last Bulletin.

The museum's fine collection of the spiders of Ontario is steadily growing. Many naturalists in different parts of the province have contributed specimens to this collection during the past year. Collections have also been made by museum parties. Knowledge of the distribution of spiders is not only of interests in itself but throws light on the factors influencing the distribution of Ontario life in general.

Conchology. Our collection of Ontario molluscs is rapidly growing through field work and donations. It is now reaching the stage where it is useful for research. Our serial register indicates more than 12,700 lots. Much more clerical work remains to be done, however. There are many uncatalogued lots—two collections obtained during the past year are still largely uncatalogued, together with the summer's field collection—and there is need of a card index.

Specimens were sent in exchange to the following institutions and persons (about five to six hundred lots altogether): Dr. H. A. Pilsbry, Philadelphia Academy of Sciences; University of Michigan; Museum of Comparative Zoology, Cambridge; C. L. Blakeslee and Mrs. Marie Callejo.

The study of land invertebrates begun in Timagami in the summer of 1937 was completed this past summer. This collection, together with the accumulated specimens in the Museum collection, will form the basis for a proposed study of the land molluscs of Ontario.

MUSEUM PUBLICATIONS

The following publications have been issued during the year:

CONTRIBUTIONS. Price twenty-five cents per copy.

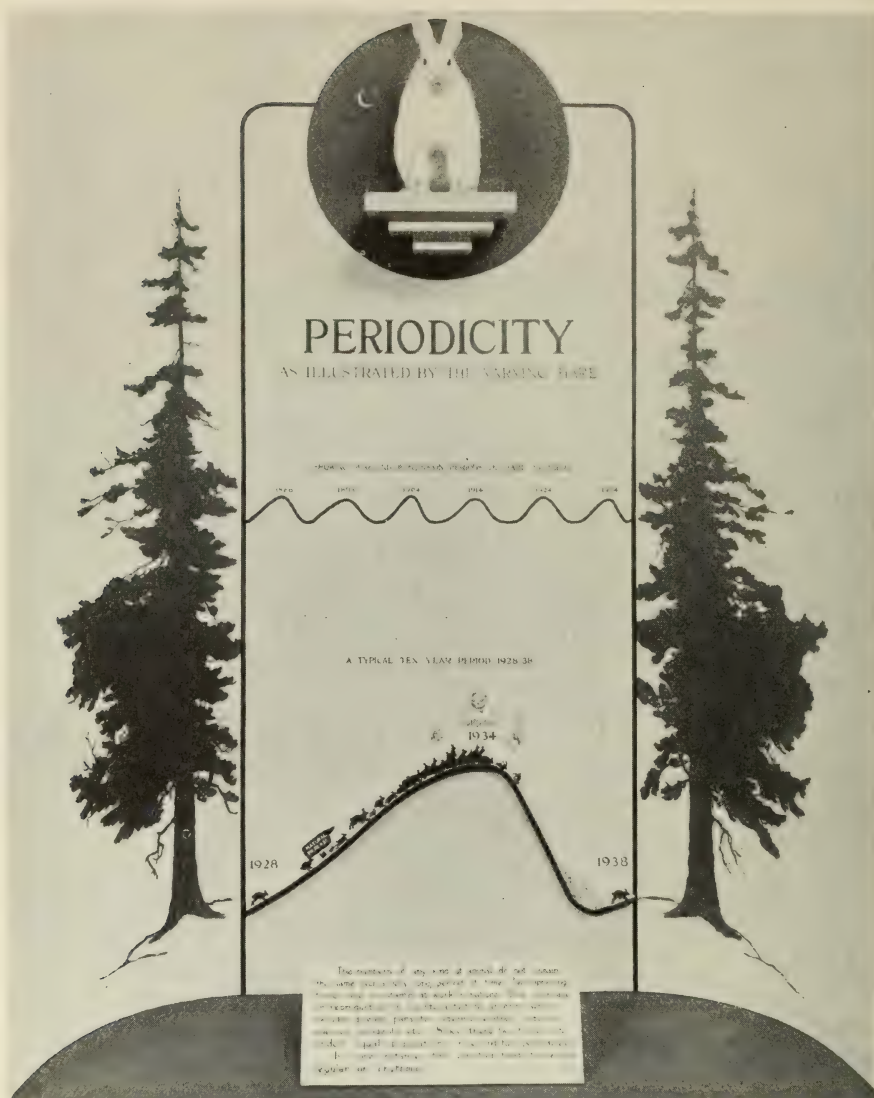
12. Ontario and its avifauna, by L. L. Snyder, and The Museum's bird collection, by J. L. Baillie, 14 pages.
13. Birds of Algonquin Provincial Park, Ontario, by D. A. MacLulich, 47 pages.
14. A faunal investigation of Western Rainy River District, Ontario, by L. L. Snyder, 57 pages.

OCCASIONAL PAPERS. Price ten cents per copy.

4. The northwest coast sharp-shinned hawk, by L. L. Snyder, 6 pages.

Additional publications in journals.

- CORFE, C. E. The praying mantis in Ontario. *Can. Entomologist*, Jan. 1938.
Unusual abundance of *Celerio lineata* in Ontario. *Can. Entomologist*, Feb., 1938.
- CROSS, E. C. Antlers, how and why. *Hunting and Fishing in Canada*, Nov., 1937.
Synaptomys borealis from Godbout, Quebec. *Jour. Mamm.* Aug., 1938.
The white-tailed deer crash. *Rod and Gun in Canada*, May, 1938.
- DOWNING, S. C. Second Ontario record for the pipistrelle. *Jour. Mamm.*, Feb., 1938.
- DYMOND, J. R. External parasites of bats. *Can. Entomologist*, Jan., 1938.
- HOPE, C. E. (with L. L. Snyder). A predator-prey relationship between *Asio flammeus* and *Microtus pennsylvanicus*. *Wilson Bull.*, June, 1938.
- KURATA, T. B. The spiders of Mer Bleue, near Ottawa. *Can. Field-Nat.*, Nov., 1937.
- UGHTON, J. G. (with A. LaRocque). A preliminary account of the Unionidae of Ontario. *Can. Journ. Res.*, Aug., 1937.
Notes on *Hygromia striolata* (Pfr.) at Toronto, Canada. *Nautilus*, Apr., 1938.
Valvata piscinalis Müller in the Great Lakes. *Nautilus*, Jul., 1938.
- SNYDER, L. L. An extralimital record of the magpie in Ontario. *Can. Field-Nat.*, Mar., 1938.
An ivory gull from Oba, Ontario. *Auk*, Apr., 1938.
(with J. M. Speirs). On the status of the starling (*Sturnus vulgaris*) at Toronto. *Can. Field-Nat.*, Nov., 1937.
(with C. E. Hope). A predator-prey relationship between *Asio flammeus* and *Microtus pennsylvanicus*, *Wilson Bull.*, June, 1938.
Social systems in nature, *Can. Science Digest*, June, 1938.
- URQUHART, F. A. Internal anatomy of the housefly, *Can. Science Digest*, June, 1938.
A new species of *Nemobius* from Ontario. *Can. Entomologist*, May, 1938.
The oviposition and cannibalistic habits of the narrow-winged katydid (*Phaneroptera pistillata* Brummer). *Can. Field-Nat.*, Apr., 1938.
The insect collection of the Royal Ontario Museum of Zoology. *Can. Entomologist*, Apr., 1938.



A MUSEUM EXHIBIT ILLUSTRATING THE PERIODIC FLUCTUATIONS IN THE POPULATIONS OF THE VARYING HARE. PERIODS OF ABUNDANCE ALTERNATING WITH PERIODS OF SCARCITY RECUR WITH SURPRISING REGULARITY IN THIS ANIMAL. THE DATES INDICATED ON THE UPPER CURVE ARE 1886, 1895, 1904, 1914, 1924, 1934. THE LOWER CURVE ILLUSTRATES A TYPICAL TEN YEAR PERIOD,—INCREASE FROM SCARCITY TO ABUNDANCE WHEN EPIDEMICS BREAK OUT PRODUCING SCARCITY AGAIN.

THE STUDY OF ANIMAL POPULATIONS

Making a census of the people of a country and of their domestic animals and other possessions has long been a practice of civilized countries; more recently it has been found necessary to know something of the numbers of wild animals as well. Most people interested in wild animals are concerned largely with their numbers; if the animals are useful, we want to know how to have more of them, if injurious, we wish to have fewer. To the officials concerned with regulating the seasons and numbers of animals to be killed it is of prime importance to know the populations of the animals concerned.

PERIODICITY IN HARE POPULATIONS

Many kinds of animals are known to vary widely in numbers from year to year. Perhaps the best known example of this is the varying hare (snow-shoe rabbit) *Lepus americanus* of the north woods of Canada. In our last Bulletin (No. 7) some account was given of the periodic fluctuations in numbers of this animal. This is illustrated graphically in a recent museum exhibit reproduced herewith. Every ten years, on the average, hares become scarce because most of them die of epidemic disease. In the next few years following their dying off they gradually increase in numbers until in seven or eight years they are abundant again. This abundance is maintained for a year or two and then epidemics begin to spread among them and soon they are scarce again as they were approximately ten years before. The years in which hares were last abundant in the Hudson Bay watershed before decreases set in were: 1856, 1864, 1875, 1886, 1895, 1905, 1914, 1924 and 1934 or 8 cycles in 78 years.

HARE NUMBERS AFFECT LIFE IN THE NORTH

These alternate periods of abundance and scarcity of hares profoundly affect life throughout the northland. Indians cut the hides of hares into strips and weave them to make warm fur blankets. But such fur robes cannot be made every year. There are only a few years in every ten when there are enough hares to provide Indians with fur blankets. When hares are numerous there is never a shortage of food for although Indians may not depend on hares as a staple article of diet, they can fall back on them when other food is scarce, but they are hard pressed when hares too are scarce.

The Indians are not the only inhabitants of the north country to miss the hares. Many fur-bearing animals relish a hare dinner. The

lynx lives on almost nothing else, while the fox, wolf, weasel and most other flesh-eating animals eat large numbers of hares when they are to be had. Birds such as the great horned owl and goshawk prey on the hare too. But it is not these natural "enemies" that lead to the scarcity of hares. The latter increase in spite of all the predators that prey on them. In fact as the hares continue to increase, the lynx, fox, horned owl and goshawk increase too, since with an abundance of food in the form of hares, more young lynxes, foxes, etc. are born and survive. As the hares approach their peak of abundance, there is general prosperity in the north woods, but when epidemics reduce the hares to scarcity the animals dependent on them for food also grow scarce. Records of the fur trade indicate that such furs as the lynx and fox rise and fall in abundance with periodic abundance and scarcity of hares.

EMIGRATION OF BIRDS WHEN HARES DIE OFF

The disappearance of the hares is felt far from the north woods in which they live; such birds as the goshawk which increase in numbers as the hares increase, is not content to remain in his northern home and starve, but moves out presumably in search of food. In the winter or two following the disappearance of the hares, goshawks occur in conspicuous numbers in the south. Thus in southern Ontario these large hawks have been seen in some numbers in the winters of 1896-7, 1906-7, 1926-7, 1934-5. The lynx and fox is believed to wander to some extent in search of food when the hares have died off but the range of their movement is not nearly as great as that of the birds.

PREY NUMBERS AFFECT PREDATOR NUMBERS

A point worth emphasizing in connection with the fluctuations of hare numbers is that it is not the "enemies" of hares which cause their scarcity; the reproductive capacity of hares and other animals is adequate to maintain and even increase their numbers in the presence of the predators which normally prey on them. It is the prey, in this case the hares, which determine the numbers of their predators. Predators do affect to some extent the numbers of their prey but the initiative lies with the prey.

LEMMING FLUCTUATIONS AND MIGRATIONS

Another animal whose numbers rise and fall from teeming abundance to scarcity is the lemming. There are several kinds of

lemmings, but all are large, long-haired relatives of the meadow mouse and all live in the Arctic regions. Their peaks of abundance occur at four year intervals on the average. Unlike the hares, lemmings do not remain at home and die of epidemics; when they become crowded through population pressure, the lemmings migrate away from their homelands. In Scandinavia these periodic lemming emigrations have been spectacular occurrences for hundreds of years. "The lemmings march chiefly at night, and may traverse more than a hundred miles of country before reaching the sea, into which they plunge unhesitatingly and continue to swim on until they die." By such wholesale emigrations their crowded numbers are reduced to more normal proportions.

Lemming migrations have not been a conspicuous feature of the Canadian Arctic although alternating periods of great abundance and scarcity are known to occur usually at four year intervals. Just as lynx, fox, horned owl, goshawk and other animals that feed on hares show the same periods of scarcity and abundance as the hares, so the animals that feed on lemmings in the Arctic are alternately abundant and scarce every four years on the average following the ups and downs of the lemming population.

LEMMING NUMBERS AFFECT ARCTIC FOX AND SNOWY OWL NUMBERS



SNOWY OWL

The Arctic fox and the snowy owl are two animals whose population numbers appear to be controlled by the lemming populations. With plenty of lemming to eat, Arctic foxes and snowy owls increase in numbers and become abundant too. When lemmings get scarce there are a lot of hungry foxes and owls and, just as goshawks come south approximately every ten years following the

disappearance of hares, so snowy owls come south more or less at four year intervals when lemmings get scarce. Below are given in parallel columns the years in which Arctic fox pelts were traded in largest numbers at Fort Chimo in Ungava peninsula, and when snowy owls were seen in southeastern Canada and neighbouring parts of the United States.

<i>Arctic Foxes abundant</i>	<i>Snowy Owl migrations</i>
1882	—
1887	—
1890	—
1893	—
1897	—
1901	1901-02
1905	1905-06
1909	—
1913	—
1917	1917-18
1921	—
1926	1926-27
1930	1930-31
1934 ?	1934-35

The fur returns of the Bureau of Statistics show that 1934-5 was the biggest white fox year since 1930-31.

That Arctic foxes sometimes emigrate in numbers at times of peak abundance is indicated by the occurrence of thousands of Arctic foxes far to the south of their normal range in southern Labrador in April and May, 1922. One was shot on Cape Breton Island in April, 1923. This southern movement of Arctic foxes was probably related to the disappearance of lemmings following the peak which gave rise to the abundance of foxes at Fort Chimo in 1921.

FLUCTUATIONS IN MOUSE POPULATIONS

The mice of more temperate regions also fluctuate widely in numbers from year to year. White-footed mice or deer mice (*Peromyscus*) in some years swarm in the forested regions of Central Canada. Meadow mice or voles (*Microtus*) occasionally reach plague proportions also. Other species, including the red-backed vole and jumping mice are known to occur in widely different numbers from year to year. Not enough information has yet been accumulated about the years and places in which these mice reach peak numbers or become scarce. We do not know for certain, therefore, whether the fluctuations in numbers of any of these mice are periodic or not in Canada.

These mice are of considerable economic importance and it is therefore essential that we attempt to understand the laws governing their changes in numbers. When meadow mice were abundant across southern Ontario they caused great injury to young orchards and to shrubbery as well as to crops especially to corn left standing in the stook in fields. In other areas they are of economic advantage. Several species of mice for instance are known to be of considerable importance in the control of spruce sawfly and larch sawfly because they eat the cocoons of these insects. Mice too form the staple food of

many fur-bearing animals. Thompson Seton has written, "What moss is to the reindeer, what grass is to the cattle, the mouse millions of the north are to all the northern carnivores from bear to *Blarina* (mole shrew). When we shall have fully worked out the life history of each of these species, I believe we shall learn that the whole of that vast, beautiful, important and specialized production that we call the Carnivora rests on a broad, simple basis of Muridae (mice), that in turn rests on the grass, that rests on the earth. We shall for each of these flesh-eaters write, 'it sometimes eats this and sometimes eats that, but by far the greatest bulk of its food is mice'".

PERIODICITY IN GROUSE POPULATIONS

Cycles of abundance and scarcity are not confined to hares, lemmings, mice and the fur-bearing animals and flesh-eating birds that prey on them. Game birds such as the ruffed grouse and sharp-tailed grouse are known to be abundant and scarce in fairly regular cycles of much the same length as those of the hares. In Ontario, ruffed grouse suffered serious diminutions in numbers in 1874, 1883-4-5, 1894-5, 1904-5-6, 1914-5-6, 1924-5, 1933-4-5. Following each of these periods of scarcity grouse recovered and were numerous for a few years prior to their cyclical disappearances. It has recently been shown that periodic diminution of grouse numbers is due to epidemics of disease as in the case of hares. In the fall of 1932 Ontario was visited by large numbers of sharp-tailed grouse. This movement is believed to have represented an emigration of these birds, caused by an unusual abundance of them in their normal homes farther north.

PEAKS OF ABUNDANCE IN DIFFERENT YEARS AT DIFFERENT PLACES

There is space in this brief account of animal populations to mention only one additional feature of these periodic fluctuations, namely that peaks of abundance do not always occur in the same year in all parts of the country. In the case of grouse and hares there is often a spread of three or four years between the time maximum numbers are attained in one part of the country as compared with another. Different areas may have mouse plagues in different years; for instance southern Ontario had a plague of meadow mice in the fall of 1935; in northwestern Ontario, the maximum numbers were not attained until 1937.

VALUE OF UNDERSTANDING POPULATION CHANGES

As information on changes in the numbers of animals accumulates, it is becoming evident that many more species of wild life than was

originally suspected are characterized by these regular periodic fluctuations in numbers. The importance of understanding the nature and causes of these fluctuations can hardly be over-emphasized. Their importance in the fur trade has already been indicated. It is too early in these studies yet to say whether anything can be done to control them, but whether we can control them or not it is of value to know that next year or five years from now certain animals will be scarce or abundant. Such knowledge is of special importance to officials concerned with making regulations for open and closed seasons, bag limits, etc.

THE MUSEUM AND POPULATION STUDIES

For several years the museum has been accumulating information on changes in the numbers of animals from year to year. This is made possible through the co-operation of many hundreds of correspondents scattered throughout Canada to whom we are deeply indebted for assistance in this work.

In studies of this kind the longer the period for which the records are made and the more areas for which reports are available, the more valuable is the accumulated information. For this reason the museum solicits the continued co-operation of its present correspondents and appeals for the assistance of others who may be able to supply information on changes in the wild life of their areas from year to year.

LITERATURE

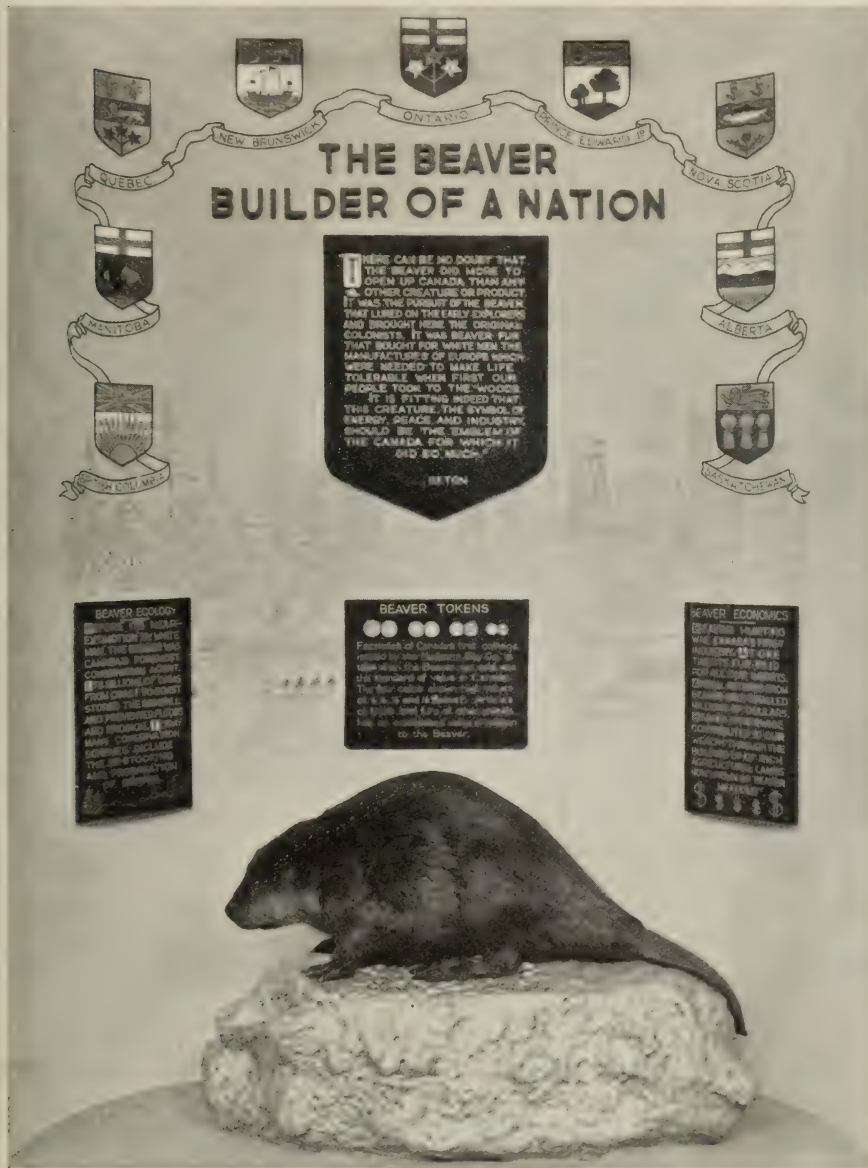
The following list of publications containing additional information on animal populations is given for the benefit of those who may wish further information on this important subject.

- A study of the sharp-tailed grouse, by L. L. Snyder. Univ. Toronto Studies, Biol. Ser. 40. Reprinted as Contributions of the Royal Ontario Museum of Zoology No. 6. 1935.
- Fluctuations in wild life, by Chas. Elton. Canada's Eastern Arctic, pp. 62-66, Dept. of Interior, Ottawa. 1935.
- Fluctuations in numbers of ruffed grouse, *Bonasa umbellus* (Linne) with special reference to Ontario, by C. H. D. Clarke, Univ. Toronto Studies, Biol. Series No. 41. 1936.
- Fluctuations in the numbers of varying hare (*Lepus americanus*), by D. A. MacLulich. Univ. Toronto Studies, Biol. Series No. 43. 1937.
- The white-tailed deer in Ontario, by E. C. Cross. Rod and Gun in Canada. Feb., 1937.
- The white-tailed deer crash, by E. C. Cross. Rod and Gun in Canada. May, 1938.
- Animal Ecology, by Chas. Elton, Director of the Bureau of Animal Population, Oxford, is a fascinating account of the principles underlying animal populations. This 200-page book was published by the Macmillan Company in 1927.

ROYAL ONTARIO MUSEUM OF ZOOLOGY

BULLETIN No. 9

TORONTO, NOVEMBER, 1940.



A NEW MUSEUM EXHIBIT ILLUSTRATING THE IMPORTANCE OF THE BEAVER TO CANADA

ACCESSIONS

The following table indicates the number of specimens of various kinds received by the Museum during the two years, October 1, 1938, to September 30, 1940.

	Donated	Collected	Purchased	Exchanged	Total
Mammals.....	514	1,214	134	11	1,873
Birds.....	33,415	1,281	542	107	35,345
Birds' eggs (sets).....	229	83	16		328
Birds' nests.....	100	72	1		173
Reptiles.....	97	60		1	158
Amphibians.....	94	341		3	438
Fish*.....	734	497	29	9	1,269
Insects.....	1,536	4,277	2,000	66	7,879
Spiders.....	127	10,813			10,940
Molluscs*.....	1,446	307	3,506	616	5,875
Other invertebrates.....	265	265			530

*Included many lots sometimes made up of large numbers of specimens.

Apart from the Fleming library which has not yet been enumerated, additions to the library included 533 bound volumes and 6,158 unbound publications.

Among outstanding donations were the following:

BARRATT, the late FRED. 268 insects, mostly Coleoptera.

BOGGS, O. D. 26 birds, 2 nests, and 14 eggs from Ecuador and Peru.

BOWEN, Dr. H. M. 64 bird skins, mostly collected in California 1887-92.

Donated with Messrs. C. F. Foster and Forest Nagler.

CLARKSON, Dr. F. A. Skin of the extinct Carolina Paroquet.

COCKBURN, R. R. Bearded seal from James Bay.

CROSS, E. J. Bay lynx.

CURTIS, M. W. 37 birds and 5 mammals.

DEEKS, D. B. 76 birds collected at Attawapiskat Post on James Bay.

DONOVAN, Mr. and Mrs. T. 69 lots of marine shells from Florida.

FIELDEN, Mrs. V. C. A champion Chow Chow.

FLEMING, the late J. H. 32,267 bird skins, 10 nests, and 32 sets of eggs.

FLETCHER, J. F. S. 7 lots of fish from Tetana Lake, northern British Columbia.

FOSTER, C. F. See BOWEN.

GOAD, Mrs. VICTOR A. E. 224 books and 130 unbound publications constituting the angling library of the late V. A. E. Goad.

GODDARD, WILLIAM. 66 mammals, 54 birds, and 19 fish from Favourable Lake, Patricia District, Ontario.

HAHN, PAUL. 4 Passenger pigeons.

HAMMELL, Mrs. J. E. Registered Brussels Griffon dog.

HERRINGTON, Rev. H. B. Several hundred lots of land shells from Hastings and Leeds counties.

HUDSON'S BAY COMPANY. 10 fish from Great Bear Lake.

HURLBURT, Dr. W. E. 85 Lepidoptera, 65 birds, 1 nest, and 3 eggs.

JOHNSON, TOM. Land shells from Favourable Lake, Patricia District, Ontario.

LA BINE, G. A. 4 ciscoes from Great Bear Lake.

LANG, K. H. 98 fish from Aklavik, N.W.T.
 LA ROCQUE, A. 425 insects.
 LEARMONTH, L. A. 20 birds from Fort Ross, Somerset Island, N.W.T.
 MARSH, Dr. PHIL. 112 lots molluscs from Michigan and south-eastern United States.
 MARSHALL, NELSON. 19 lots of Florida fishes.
 MCINTYRE, B. 116 Orthoptera.
 NAGLER, FOREST. See BOWEN.
 NATIONAL MUSEUM OF CANADA. 275 lots of Canadian marine shells.
 NATIONAL PARKS BUREAU. Rocky Mountain caribou.
 ONTARIO DEPARTMENT OF GAME AND FISHERIES. 2 pheasants, 2 mallards, 3 brown trout, and 24 lots of fishes.
 RAWSON, Dr. D. S. 9 fish and 30 amphibians from Saskatchewan and Alberta.
 REYNOLDS, KEITH. 42 birds.
 RICHARDSON, G. H. 255 birds, 8 volumes Morris's *British Birds* and 1 volume Shaw's *General Natural History*.
 RICKER, Dr. W. E. 150 stoneflies.
 SCHNAUFER, T. A. 4 muskrat skins for exhibit, "Muskrat to Hudson Seal."
 SCOVELL, Rev. G. S. Case containing 27 Australian birds, collected about 1880 by Geo. Scovell, his grandfather.
 SHERBARTH, J. T. 28 volumes, ninth edition, *Encyclopedia Britannica*.
 THOMPSON, STUART L. 40 miscellaneous insects.
 TORONTO PARKS DEPARTMENT. 23 mammals and 9 birds.
 WALKER, Dr. E. M. 281 Orthoptera.
 WHELAN, R. V. Several feet of Kodachrome film and 96 insects.
 WHITE, H. C. 51 fish.
 WILMOT, Mrs. Pedigreed springer spaniel.
 YOUNG, FRANK. 16 lots representing several varieties of the variable and beautifully coloured tree snails.

FIELD WORK

Investigation of the natural history of the northern regions of Ontario was continued during the summers of 1939 and 1940 when expeditions were sent to the Attawapiskat and Severn River areas respectively. These surveys which were financed by a grant from the Reuben Wells Leonard bequest were carried out by C. E. Hope and L. A. Prince of the Museum staff and a student assistant, W. B. Scott.

Probably no area of comparable size in North America is less known, so far as natural history is concerned, than the Patricia portion of Kenora District in spite of the fact that this area was one of the first parts of Ontario whose natural history received attention. In 1768 Andrew Graham, Governor of the Hudson's Bay Company post at Severn River, sent a number of birds and mammals from that region to the Royal Society of England. Of the five species of birds new to science described as a result of this early collecting, four were obtained in series by our party which visited the same area during the summer of 1940. Another early student of natural history in the Hudson Bay region of Ontario was T. Hutchins, Governor of Fort Albany, who made extensive collections there and at Fort Severn, and about 1782 wrote an account of his work under the title,

"Observations on Hudson's Bay." This manuscript is still in the library of the Hudson's Bay Company unpublished.

In late May, 1939, our party flew north to Lansdowne House on Lake Attawapiskat. Twenty-six species of mammals were recorded for the area and 405 specimens representing 14 species secured for the Museum collection. In general, the mammal fauna was found to be similar to that of the Favourable Lake area visited the previous year.

Birds recorded totalled 90 species and 80 kinds were collected with a total of 405 specimens. Brewer's blackbird, which had not previously been collected in the province was secured. Western affinities of the bird fauna were apparent. The collection of reptiles totalled 8 specimens of one species and of amphibians 62 specimens of three species. Other material secured included 1,563 insects, 150 spiders, 23 lots of molluscs, and about 400 plant specimens.

In 1940 the same party left Toronto on June 4, reaching Ilford, Manitoba, from where they were to fly to Fort Severn on June 8. Unfavourable weather delayed the flight until June 15. On noon of that day the party reached Fort Severn and were soon established in a building placed at their disposal by the Hudson's Bay Company. Thirty-seven days were spent collecting specimens and making observations on the fauna of the region. The party left Fort Severn on July 23 on the Hudson's Bay Company schooner, *Severn*, and two days later reached Churchill, Manitoba. Four days were spent at Churchill during which time a white whale which had been captured was measured, photographed, and the skeleton roughed out and two embryos preserved. Toronto was reached on August 3.

The mammal collection, numbering 261 specimens, was obtained and prepared by Mr. Prince. Four species originally described from the area are represented by excellent series. These species are the cinereus shrew, saddle-back shrew, red squirrel, and meadow jumping mouse. Important information regarding fur-bearing and game mammals of the Severn region was obtained from Mr. J. E. J. Wilson, manager of the Hudson's Bay Company post.

The bird collection of 273 specimens was collected and prepared by Mr. Hope. Ninety species of birds were found to occur in the region; of these 75 are represented in the collection. Three species, viz., white-crowned sparrow, blackpoll warbler, and Hudsonian chickadee have Fort Severn as their type locality. An adequate series of each of these was obtained.

Fishes, amphibians, and reptiles were collected by Mr. Scott. Records of 21 species of fish occurring in the area were obtained. Most of these are represented in the collection including eastern speckled trout (up to $3\frac{1}{2}$ lbs.). Only two species of frogs are known from the region.

Although the party did not include an entomologist, 1,200 specimens of insects were secured largely by Mr. Hope. These included a considerable collection of dragon flies. Much material in other groups including molluscs, spiders, rotifers, etc., as well as several hundred pages of notes and 200 photographs were obtained.

In 1939 an expedition from the Museum made a survey of the region from Cochrane north to Moosonee on southern James Bay. Messrs. Snyder, Shortt, and Downing of the staff, accompanied by Mr. D. B. Deeks, a volunteer collector, and two students, Messrs. G. H. Clawson and D. M. Kirk, made collections and field studies at four camps—Genier, Abitibi Canyon, Onakawana, and Moosonee.

Approximately 38 species of mammals were recorded for the region, 25 of which are represented in the collection. The total number of specimens in the collection was 475.

Bird work tabulated 113 birds for the region, 88 of which are represented in the collection. The total collection comprised 503 specimens, and represents one of the most complete and selectively balanced collections secured on our surveys.

No one accompanying the expedition was specially concerned with the collecting of fish but 26 specimens were secured. Other material obtained included 13 reptiles of one species and 59 amphibians of three species, 235 insects, 38 lots of molluscs, and other miscellaneous material.

Other members of the staff made field studies and collected material on their vacation or during short field excursions. The total number of specimens collected during the two summers is given in the table, page 2.

MUSEUM EXHIBITION

Exhibits installed include two of the new style exhibits, one illustrating the beaver and its importance to Canada and the other the muskrat, showing the manufacture of Hudson seal from the skins of this prolific little fur-bearer. Another exhibit designed to illustrate the game, fur, and game fish resources of Ontario is nearing completion. Besides featuring these wild life resources, the exhibit will emphasize the work of the Ontario Department of Game and Fisheries in their management and conservation. Other additions were Rocky Mountain caribou, white-tailed deer, black fox, silver fox, bay lynx, pug dog, and wire-haired terrier. An interesting addition to the exhibits is a model of a house fly fifty times as large as the actual animal. Enlarged models of this kind are of great educational value since they show features such as the hairy legs and expanded tongue which offer such perfect devices for carrying disease organisms from the filth on which flies alight, to human food and utensils.

With the filling up of our gallery with permanent exhibits, attention is being given to temporary exhibits. Some of those arranged during the period covered by this report included reproductions of Audubon's bird paintings; sketches of animals made in our gallery by students of the Northern Vocational School; bird paintings by Fred Barratt; nature photographs by local naturalist photographers; works of Edwards and Catesby (which are among the earliest works on the natural history of North America); natural history notes and publications of Charles Fothergill, who came to Canada in 1816; and an exhibit of the results of the summers' field expeditions; recent donations by O. D. Boggs (birds of Peru and Ecuador), L. A. Learmonth (birds of the Arctic), Miss Jean Bodaly (birds of Portuguese West Africa), and the Rev. A. P. and Peter Quentin (birds of China); and Allan Brooks' bird paintings. Each year at Easter time the Toronto Aquarium Society arranges an exhibition of tropical aquarium fish which always attracts much favourable comment. A collection of living fishes, amphibians, reptiles, etc., is changed from time to time.

"INFORMATION PLEASE"

Man is an inquisitive animal. No one knows this better than the staffs of natural history museums who answer thousands of questions each year. In a recent issue of *Natural History*, the journal of the American Museum of Natural History, the Director says that his institution is called on to answer 25,000 questions a year and that one-third of the time of the staff is devoted to answering questions asked by the public. He estimates that half of these questions are technical and deal with intricate scientific subjects; the other half, non-scientific and personal.

At the Royal Ontario Museum of Zoology we get our share of questions, scientific and personal. Some of the latter may appear trivial but to the inquirer every question presents a real problem. For instance, there was the lady who wanted to know the colour of a swan's bill.

"What kind of swan?" she was asked.

"Oh, it doesn't matter," she replied, "I'm doing a piece of fancy work and I wanted to use the right colour for the swan's bill."

Since the cross-word puzzle craze has died down we do not get so many questions such as, "What is a three-letter word of which the second letter is i, the native name of a Hawaiian fish?" We supplied the answer, "oio."

Questions come to us by letter, by telephone, and by personal call. In the average year we send out more than 2,500 letters, many of them

in answer to inquiries of one kind or another. The following list will give some idea of the variety of questions that come to us.

From a medical research institution asking if a mouse found to carry a certain type of tubercle bacillus in England also occurred in Canada, if not, what is its nearest relative here. Study of this bacillus may constitute an important advance in medicine.

From the same medical research institution asking for the name of an Australian rodent specially adapted for living under desert conditions.

What are the principal food fishes found in the Canadian Arctic?

How can I get rid of bats in my summer cottage?

Soap disappears from the washroom in our office. The janitor says rats are eating it. Do rats eat soap?

Scientists, naturalists, and others send us manuscripts to check zoological information. Magazines and newspapers consult the Museum when in doubt about the accuracy of articles and news items.

Boys' and girls' camps ask where they can get nature leaders.

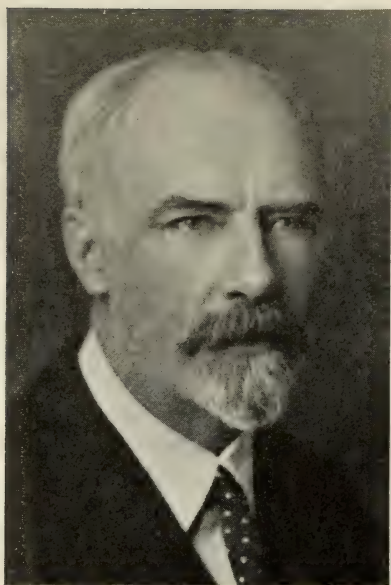
A gardener asks our assistance in identifying the animal responsible for destroying his corn.

Assistance in the identification of specimens is one of the commonest requests made of the Museum. It is not always easy or possible to identify a bird, insect, or fish from a verbal description over the telephone or by letter. Often the animal concerned is known or suspected of being destructive. For instance, a lady telephoned to know if the little flat insects running around in the house she had just moved into, would eat her good rugs. Often the correct identification of an animal is worth a good deal of money to the inquirer. If the gentleman who burned up fifty dollars' worth of mattresses suspected of harbouring bed bugs had consulted us before, instead of after, burning them, he would have learned that the suspected insects had probably been brought into his summer home by bats and were bat bugs and not bed bugs. Sometimes whole collections are sent for identification. No biologist can be an authority on more than a few groups of animals and if he is making a biological survey of an area he must send many of the animals, for instance, fishes, molluscs, leeches, insects, spiders, etc., somewhere for correct identification. The identification of such material is one of the recognized functions of natural history museums. The Royal Ontario Museum of Zoology is the only place in Canada where the identification of some groups of animals can be made. For other groups specimens must be sent to other Canadian institutions or to the United States.

The Museum is always delighted to supply information on natural history matters whenever possible.

JAMES HENRY FLEMING

1872-1940



JAMES HENRY FLEMING

James Henry Fleming, Honorary Curator, Division of Birds, Royal Ontario Museum of Zoology, died at his home in Toronto on June 27, 1940. Mr. Fleming was a well-known figure in world-wide ornithological affairs. He had acted as Canadian representative at several International Ornithological Congresses in Europe and had served three years as President of the American Ornithologists' Union (1932-5).

In 1927 Mr. Fleming consented to act as an adviser to our Museum and was duly appointed an Honorary Curator by the Board of Trustees. His great knowledge of birds of the world became a valued asset of the Museum and

his practical and constant interest in many phases of Museum work was always helpful and encouraging to members of the staff.

Mr. Fleming was one of the most enthusiastic, well-informed, and effective pioneers of the museum idea in Canada. Long before the Royal Ontario Museum of Zoology was founded he had undertaken the building of a private ornithological museum. His life was devoted to this enterprise and he always had in mind that he was preserving valuable material for the ultimate enrichment of some public Canadian institution.

It has come to pass that the Royal Ontario Museum of Zoology was chosen by him as the final repository of his library and research collections. The Fleming bequest is unparalleled in the history of the Museum of Zoology. In many respects it could never be duplicated. The library, as yet incompletely catalogued totals several thousand volumes consisting of the principal literature on birds in the English language. Complete sets of periodicals and an extensive collection of unbound scientific papers provide a rich source for reference and remove a serious and long-felt deficiency in the Museum's files of scientific literature.

The Fleming bird collection nearly doubles the research material

which had been brought together by the Museum. It totals 32,267 specimens. Actually the Fleming collection is more representative of the birds of the world than was the Museum's collection. Of the 166 families of modern birds (Wetmore's List, 1940) only three are unrepresented in the Fleming collection, and of the approximately 2,600 modern genera it contains 2,073. Extinct birds, rare specimens from island areas, North American birds from their South American winter homes, a number of types, many topotypes, numerous long series showing geographic and other variations combine to make the Fleming collection an invaluable one.

The Royal Ontario Museum of Zoology and scientific workers everywhere will for all time owe a debt of gratitude to James Henry Fleming. Apart from his published notes and papers (numbering more than eighty titles) and the many direct and indirect aids rendered to workers during his lifetime, the effect of Mr. Fleming's labours will continue to be felt. His collection will always be a reservoir of facts, and his library, a source of information. The Museum and its staff are indeed appreciative of Mr. Fleming, the friend and adviser, grateful for his bequest and happy that we are in a position to accept and care for the treasures left by him.

A HISTORY OF THE COLLECTIONS OF THE ROYAL ONTARIO MUSEUM OF ZOOLOGY

In 1939 the Royal Ontario Museum completed the first quarter-century of its existence. However, at the time of the official opening by his Royal Highness, the Duke of Connaught, Governor-General of Canada, in March, 1914, the Museum contained no zoological collection. It was not until May, 1915, that the first zoological material was moved from the Museum of the University Biological Department.

The opening of the Royal Ontario Museum marked the culmination of long years of dreaming and planning and active collecting on the part of many individuals and institutions. From the earliest days of settlement in Upper Canada, naturalists had planned and worked for a museum to exhibit the animal life of the area. Probably the earliest attempt to found a museum was that of Charles Fothergill, who came to Upper Canada in 1817, was King's Printer from 1822-6, and represented Durham County in the Legislative Assembly from 1825-9. Fothergill, in conjunction with Dr. Rees, a mineralogist, and Dr. Dunlop, was instrumental in petitioning the Legislative Assembly in 1833, urging the establishment of a museum at York (Toronto). These gentlemen succeeded in obtaining from the Government a grant of land on the Garrison Commons for their museum. Although the project was patronized by successive Lieutenant-Governors and

the site provided by Order-in-Council, it fell through on Fothergill's death in 1840 and on the destruction by fire of his collection of objects shortly afterwards.

The collections of the Biological Department from which the nucleus of the Royal Ontario Museum's zoological material came had their origin in the early days of the University. There is in the possession of the Museum an early catalogue of the collections begun by Professor Hincks in 1857. Hincks had been appointed Professor of Natural History in the University in 1853.

When University College was gutted by fire on February 14, 1890, the Museum, which had been housed in what is now known as West Hall, was moved out, although it had suffered comparatively little from the fire. Following this, the recently completed Biological Building was enlarged to accommodate the Museum. For many years the museum wing of this building housed not only the zoological collections, but also those of mineralogy, geology, and palaeontology.

Under the direction of Professor Ramsay Wright, Head of the Department of Biology from 1874 to 1912, the Museum was developed into the finest zoological collection in Canada. University funds supplemented by donations from private benefactors were used to purchase specimens representing all of the important groups of animals. The one weakness of the collection at this stage of its existence was in the dearth of Canadian material; up to this time the Canadian fauna had received comparatively little study from either zoologists or naturalists.

The first important collection of Canadian material acquired by the Biological Museum was that of Dr. J. H. Garnier, a naturalist-physician of Lucknow, Ontario. This collection, received in 1891, was especially rich in amphibians and reptiles, but contained some birds and mammals as well. Although it too was chiefly of foreign origin, representatives of Ontario forms were included. Addition of other Canadian material resulted from the work of naturalists including Sir Casimir Gzowski, the Rev. John Doel, Mr. J. H. Ames, and the Biological Society of Ontario.

Some idea of the rate of growth of the collections may be had from statements of the number of specimens in the Museum at different stages of its development. An early catalogue indicates that 735 specimens were in the museum in 1870. In 1897, according to an article on the Museums of Canada in the *Report* of the British Association for the Advancement of Science for that year, "The Biological Museum contains between 15,000 and 20,000 specimens, of which the geological department includes about 12,000 specimens. The zoological collections alone number 8,000 specimens, and include specimens of living and fossil representatives of the various classes and

orders of the animal kingdom, as well as a large series of models for educational purposes." A catalogue of accessions for 1900 to 1912 inclusive lists 4,900 specimens received during that period. At the time of the establishment of the Royal Ontario Museum, the collections of the Biological Museum probably included in the neighbourhood of 20,000 zoological specimens.

Although the University Department of Biology had most to do with the development of the collections which came to the Royal Ontario Museum of Zoology, on its founding other institutions helped to foster the museum idea in Toronto and contributed material ultimately incorporated in the early collections. One of the most important of these was the Canadian Institute (now Royal Canadian Institute) founded in 1849: the formation of a "provincial museum" was one of the objects for which the Institute was established. The natural history collections of the Canadian Institute which were later transferred to the Royal Ontario Museum appear to have had their inception in 1885 when the Natural History Society of Toronto amalgamated with the Canadian Institute, bringing with it its collections of natural history material and forming the Biological Section of the Institute. Later there was organized within the Biological Section an Ornithological Subsection. In the minutes of the meetings of this subsection, mention is made in a number of places of steps being taken to add to the bird collection. In a report on "The State of the Principal Museums in Canada and Newfoundland" by Henry M. Ami, published in the *Report of the British Association for the Advancement of Science for 1897*, pp. 62-74, the Canadian Institute Museum was said to contain 729 Canadian birds, 329 Canadian birds' eggs, 150 foreign birds, 62 mammals, 200 reptiles, and 2,000 insects. The collection had probably increased little beyond this when it was transferred to the Royal Ontario Museum of Zoology in 1924.

The Toronto Normal School was another centre of development of the museum idea in Toronto. The Legislature of 1852-3 appropriated £500 per annum to be used by the Museum of the Normal School for the purchase of books, publications, specimens, models, objects relating to education and other departments, which included "Artificial productions of Canada, especially referring to mineralogy, zoology, agriculture and manufacturing." Until after 1896, natural history material seems to have occupied a very subsidiary position in the collection of the Normal School. With the addition of a third storey to the building about 1896, the Museum was considerably enlarged, and the hastily prepared collection of birds and mammals was included at this time.

In 1906, the Museum was raised to the status of Provincial Museum. Dr. William Brodie was appointed first Provincial Biologist

in 1903, and his extensive collections of biological material acquired by the Museum. The old collection of birds and animals was in part replaced by the purchase of new material from Mr. John Maughan Jr., and Mr. Maughan was commissioned to complete the exhibition collections.

Mr. Charles W. Nash, who became a lecturer on biology for the Ontario Department of Agriculture, began in 1900 a series of check-lists of vertebrates for the Museum. This series, reissued as *The Manual of the Vertebrates of Ontario*, was an important contribution to our knowledge of the vertebrate fauna of the province. Mr. Nash prepared a large number of casts of fish, reptiles, etc., for the Museum and in 1908 presented his private collection of biology to the Museum. In 1910, Mr. Nash succeeded the late Dr. Brodie as Provincial Biologist. With such men as Boyle, Brodie, Nash, and Maughan on the staff, the Provincial Museum became the centre of information for teachers and students of natural history. Mr. Nash died in 1926, and in 1933 the Museum was closed, the archaeological and biological material going to the Royal Ontario Museum.

The Natural History Society of Toronto, to which reference has already been made, was the first society in Toronto devoted exclusively to a study of the natural sciences; it was incorporated in 1878. This society was founded by Dr. William Brodie. This group affiliated with the Canadian Institute as its Biological Section on January 23, 1886, and in 1893 drew away from the Institute and formed the Biological Society of Ontario. The latter organization accumulated a collection of bird and mammal skins which was given to the Biological Museum in 1911.

Professor Ramsay Wright retired as Head of the Department of Biology in 1912 and was succeeded by Dr. B. A. Bensley, and it was at Dr. Bensley's request that the Board of Trustees established the Royal Ontario Museum of Zoology. The original resolution of the Board dated October 16, 1913, created a section known as the Royal Ontario Museum of Natural History but the name was changed on April 24, 1914, to the Royal Ontario Museum of Zoology. The zoological collections were given a gallery 104 by 62 feet at the north end of the upper floor of the original building. As a nucleus of exhibition material, several hundred specimens were transferred from the Biological Museum. In the selection of this material, preference was given to Canadian animals, although such brilliant and striking exotics as birds of paradise, parrots, and humming birds were included, also a collection of foreign game birds. The exhibit thus assembled included a fairly representative collection of the birds of Canada, a much less adequate representation of Canadian mammals, twelve cases of insects, chiefly Canadian. Fishes, amphibians, reptiles, and

invertebrates other than insects were poorly represented, although there were included casts of the five species of Pacific salmon presented by the Government of British Columbia.

The needs of a public museum such as those of the Royal Ontario Museum could not be adequately met either in the amount or nature of material available in the Biological Museum and steps were soon taken to augment it by the preparation of specimens specially suited to the needs of the new museum. Additions to the mammal collection were made through the mounting of such species as wolves and deer by taxidermists employed on a temporary basis. Using material from the University Department of Biology, systematic series of many invertebrate groups were prepared by Dr. Walker and Mr. Kurata. Many of these, including spiders, crustaceans, worms, etc., were mounted in alcohol in cylindrical museum jars, but a collection of mollusc shells and dried starfish was displayed in table cases. Contributions of material from public bodies and private individuals were soon forthcoming.

Mr. T. B. Kurata, who had been transferred to the Royal Ontario Museum on the organization of the Museum of Zoology, was at first the only member of the staff besides Dr. Bensley, Director, and Dr. E. M. Walker, Assistant Director, both of whom had heavy responsibilities in the Department of Biology. During the next two years, the staff was increased by the appointment of Messrs. E. B. S. Logier and L. L. Snyder, and exhibits more in line with modern museum practice than those transferred from the Biological Museum were prepared for the new galleries.

It was not long before the original Royal Ontario Museum building was found to be inadequate for the rapidly expanding exhibits and research material. This was especially true in the case of the Museum of Zoology, which, instituted after the museum had been organized on the basis of only four components, Archaeology, Geology, Mineralogy, and Palaeontology, could be given only very limited space. As a matter of fact, it was only after moving into the 1931 extension that the Museum of Zoology was able to organize on the basis of a properly constituted museum. The work of the Museum since that time has been outlined in the *Bulletin* beginning with number 5.

In the development of the Royal Ontario Museum of Zoology, it has always been the aim to keep a proper balance between exhibits and research, that is, between the popular and scientific phases of museum work.

On the exhibition side, the aim has been to make the exhibit tell its own story with the minimum of descriptive label. This is accomplished in part by the provision of accessory material designed to suggest something of the habitat in which the animals live. This

trend in museum exhibition has culminated in the habitat group which depicts an animal amid a representation of its natural surroundings. Usually such a group includes a panoramic picture as a background. Only two large habitat groups have so far been attempted, those illustrating the black bear and the passenger pigeon, but a series of twenty-four smaller exhibits of the same type illustrate the habitat of a number of common Ontario mammals, birds, and reptiles. A series of new type exhibits is now in course of preparation. One of these is illustrated on the cover of this *Bulletin*. Since the opening of the larger galleries in 1932, many of the larger mammals of Canada for which space was not available in the original building have been added to the exhibition series. The fishes, amphibians, and reptiles of Canada are represented by realistically coloured replicas of actual specimens.

Not all a museum's specimens are on exhibition; in every large natural history museum, there are hundreds of specimens preserved in a research collection for every one on exhibition in the public galleries. One of the primary functions of a Museum of Zoology is to study the animal life, particularly of the region it serves. The specimens on which such studies are based are secured chiefly by field surveys carried out by the Museum's own staff, but some material is obtained by donation, by purchase, and by exchange. The need that existed prior to the establishment of the Royal Ontario Museum for an institution to investigate the animal life of Ontario is shown by the fact that, since its inception, approximately sixty species of vertebrates not previously known to occur in Ontario have been found within the province.

Following are the numbers of specimens in the various groups contained in the Museum's research collections at the end of 1939: mammals, 12,000; birds, 33,372; reptiles, 1,680; amphibians, 4,979; fishes, 10,371 (lots); insects, 250,000; spiders, 4,496 (lots); molluscs, 20,043 (lots); miscellaneous invertebrates, 2,164 (lots). In the case of fish, spiders, molluscs, etc., a lot often contains a number of specimens collected in the same place at the same time.

The staff of the Royal Ontario Museum of Zoology at the present time consists of the following:

J. R. DYMOND.....	Director
L. L. SNYDER.....	Assistant Director and Curator, Division of Birds
T. B. KURATA.....	Technologist and arachnologist
E. B. S. LOGIER.....	Artist and herpetologist
J. L. BAILLIE.....	Cataloguer, Division of Birds
T. M. SHORTT.....	Associate and Artist, Division of Birds
C. E. HOPE.....	Assistant, Division of Birds
J. G. OUGHTON.....	Associate in Invertebrate Zoology
F. A. URQUHART.....	Lecturer and entomologist

E. C. CROSS.....	Acting Curator, Division of Mammals
E. G. McDOUGALL.....	Librarian
C. E. CORFE.....	Assistant, Division of Insects
K. A. NIELSEN.....	Taxidermist
L. A. PRINCE.....	Assistant, Division of Mammals
S. C. DOWNING.....	Cataloguer, Division of Mammals
EDNA BOISSONNEAU.....	Secretary
ISOBEL RADFORTH.....	Research assistant in ichthyology

Part-time assistance is given by the following:

E. M. WALKER.....	Honorary Curator of Invertebrate Zoology
JOHN EDMONDS.....	Honorary Associate in Ornithology
PHYLLIS OUGHTON.....	Secretarial assistant
AUDREY SHORTT.....	Photographer
W. B. SCOTT.....	Assistant, Division of Fishes

PUBLICATIONS

The following Museum publications have appeared during the past two years:

CONTRIBUTIONS. Price twenty-five cents per copy.

15. The fishes of the Ottawa region, by J. R. Dymond. 43 pages.
16. The birds of the vicinity of Lake Nipissing, Ontario, by W. E. Ricker and C. H. D. Clarke. 25 pages.
17. The summer birds of Yakutat Bay, Alaska, by T. M. Shortt. 30 pages.
18. History of the Royal Ontario Museum of Zoology, by J. R. Dymond. 52 pages.

HANDBOOKS. Price thirty-five cents.

4. The reptiles of Ontario, by E. B. S. Logier. 63 pages; describes 18 kinds of snakes, 9 turtles, and one lizard known to occur in Ontario.

OCCASIONAL PAPERS. Price ten cents.

5. On *Melospiza melodia* in Ontario, by J. H. Fleming and L. L. Snyder.

MIMEOGRAPHED CIRCULARS.

The keeping of fish, amphibians and reptiles in aquaria and terraria, by E. B. S. Logier.

Hints to collectors of land and freshwater molluscs, by J. G. Oughton.

Aids to the study of nature in Ontario—a list of books and other publications suitable for teachers and others interested in the study of nature.

Hibernation, the winter sleep of animals.

The smelt in the Great Lakes.

Additional publications in journals.

BAILLIE, J. L. Breeding of the lesser scaup duck in southern Ontario. *Wilson Bull.* 51: 184. 1939.

A northern occurrence of the grasshopper sparrow. *Wilson Bull.* 51: 186. 1939.

The northern chipmunk in Parry Sound District, Ontario. *Can. Field-Nat.* 53: 59. 1939.

- Four additional breeding birds of Ontario. *Can. Field-Nat.* 53: 130-1. 1939.
 King rail breeding in southern Ontario. *Auk* 57: 109-10. 1940.
 A gathering of swifts. *Can. Nature* 2: 44. 1940.
 The summer distribution of the eastern evening grosbeak. *Can. Field-Nat.* 54: 15-25. 1940.
- CORFE, C. E. *Celerio lineata* in Ontario. *Can. Field-Nat.* 53: 58. 1939.
- CROSS, E. C. Arthritis among wolves. *Can. Field-Nat.* 53: 2-4. 1940.
 Periodic fluctuations in numbers of the red fox in Ontario. *Journ. Mam.* 21: 294-306. 1940.
- DYMOND, J. R. The study of animal populations. *Rod and Gun in Can.* 40:17-18, 26-27. 1939.
 (with W. J. K. HARKNESS) Fishes of King Township in The Natural Resources of King Township. 1938.
 Canadian conservation problems. *Bird Lore* 41: 141-146, 233-237. 1939.
 Cod x haddock hybrids? *Can. Field-Nat.* 43: 91. 1939.
 Zoology in Canada in a History of Science in Canada, pp. 41-57. 1939.
 (with A. G. HUNTSMAN). Pacific salmon not established in Atlantic waters. *Science* 91: 447-449. 1940.
- KURATA, T. B. A list of the spiders of York County, Ontario, Canada. *Can. Field-Nat.* 43: 80-83. 1939.
 Observations on the burrowing wolf spider, *Lycosa missouriensis* Bks. *Can. Field-Nat.* 43: 84-85. 1939.
- LOGIER, E. B. S. Butler's garter snake in Ontario. *Copeia*, no. 1. 1939.
- OUGHTON, J. G. An observation on *Bulinnea megasoma*. *Nautilus* 52: 106. 1939.
 The burrow of an Arctic spider, *Lycosa asivak* Emerton. *Can. Field-Nat.* 53: 123-124. 1939.
 Shells you should know. *Can. Nature* 1: 37. 1939.
 More common shells. *Can. Nature* 2: 45. 1939.
 (with R. V. WHELAN). Land mollusks of Smoky Falls, Cochrane District, Ontario. *Can. Field-Nat.* 53: 99-101. 1939.
 (with A. LA ROCQUE). Francis Robert Latchford, 1856-1938. *Can. Field-Nat.* 53: 111-113. 1939.
 (with the Rev. H. B. HERRINGTON). Land molluscs of Hastings County, Ontario. *Can. Field-Nat.* 54: 42-43. 1940.
 Land molluscs collected at Hebron, Labrador and Lake Harbour, South Baffin Island. *Nautilus* 53: 4. 1940.
 A visit to the Arctic of Eastern Canada. *Nautilus* 54: 1. 1940.
- SHORTT, T. M. Chickadees in art. *Can. Nature* 2:19. 1939.
 Flickers to colour. *Can. Nature* 4:13. 1940.
- SNYDER, L. L. Great Plains races of sharp-tailed grouse. *Auk* 56: 184-185. 1939.
 A plan of Ontario subdivisions and their names for naturalists. *Can. Field-Nat.* 53: 22-24. 1939.
- TWO birds with one stone. *Can. Field-Nat.* 53: 11-12. 1939.
- URQUHART, F. A. The American locust *Schistocerca americana* Drury (Orthoptera). *Can. Field-Nat.* 53: 24-25. 1939.
 Natural history in the classroom. *The School* 27: 575. 1939.
 The dobson-fly. *Can. Nature* 1:15. 1939.
 (with E. M. WALKER). New records and notes of Orthoptera in Ontario. *Can. Ent.* 72:12-19. 1940.

LIBRARY
ROYAL ONTARIO MUSEUM

